JULY 1952

Chemical Engineering

BUILDERS OF THE CHEMICAL CENTURY

50 YEARS PAST . . 50 YEARS AHEAD

A McGRAW HILL PUBLICATION • ONE DOLLAR

Remember – the trade marks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS, INC.

Engineered for efficient flow

EFFICIENT FLOW in piping systems is worth striving for . . . it saves kilowatt-hours and avoids over-investment in equipment. That's why, on this TUBE-TURN Welding Elbow, so much engineering attention is devoted to true circularity, smooth inner walls, and exact radius. They all contribute to minimum flow resistance and reduced pressure loss.

When you specify TUBE-TURN Welding Fittings and Flanges you are specifying careful engineering. Get in touch with your nearby TUBE TURNS' Distributor. You'll find one in every principal city.

Write Dept. H-7 for free booklet "Pipe and Fitting Materials" which gives specifications, properties and welding procedures for various materials.

Be sure you see the double "tt"

TUBE TURNS, INC. LOUISVILLE 1, KENTUCKY

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Chicago • Houston • Tulsa • San Francisco • Los Angeles
TUBE TURNS OF CANADA LIMITED, CHATHAM, ONTARIO . . . A wholly owned subsidiary of TUBE TURNS, INC.

JULY
1952

Chemical Engineering

WITH CHEMICAL & METALLURGICAL ENGINEERING

PUBLISHER.....Wallace F. Traendly
EDITORIAL DIRECTOR....Sidney D. Kirkpatrick
EDITOR.....John R. Callaham
MANAGING EDITOR.....Lester B. Pope
SENIOR ASSOCIATE EDITOR...T. R. Olive
ASSOCIATE EDITOR.....Cecil H. Chilton
ASSISTANT EDITOR...Morgan M. Hoover
ASSISTANT EDITOR....Richard V. Reeves
ASSISTANT EDITOR.....Calvin S. Cronan
NEWS EDITOR.....Joseph A. O'Connor
EDITORIAL ASSISTANT.....Frances Arne
EDITORIAL ASSISTANT..A. J. O'Brien, Jr.
ART EDITOR.....Margaret Redfield
SOUTHWEST EDITOR.....James A. Lee
WEST COAST EDITOR.....Elliott Schrier
MIDWEST EDITOR.....Frank C. Byrnes
WASHINGTON EDITORS....R. S. McBride
G. S. Bryant, Jr., John Kent

CHEMICAL ENGINEERING'S 50th ANNIVERSARY

Builders of the Chemical Century ..... Editorial Foreword 145
Foundations for Advances and Achievements ..... Sidney D. Kirkpatrick 146
From Editorial Scrapbooks 154
Reminiscences of William H. Walker ..... W. K. Lewis 158
Process Industries Pace Nation's Growth ..... R. H. Ewell 160
Building the Literature of Chemical Engineering 166
Chemical Engineering's Roll of Honor and Contemporaries 174
Problems of the Future of the Chemical Process Industries 179

PROCESSES AND PRODUCTS

Cheap Way to Remove Fluorides From Water ..... James A. Lee 211
How Low Density Solids Are Made ..... John A. Abbott 212
Insulating Paper vs. Asbestos 248
Hardboard From Slabwood ..... Pictured Flowsheet 258
Product News 248

ENGINEERING AND EQUIPMENT

New Graph Correlates Operating Labor Data for Chemical Processes ..... Henry E. Wessel 209
Nomograph for Combustion Control ..... J. F. Voorwijk 216
Cathodic Engineering Previews ..... E. E. Nicholas 220
New Chlorine Cell Built in Four Layers 265
Hastelloy Alloy B ..... Edward D. Weisert 314
Plant Notebook 222
Equipment News 226
Corrosion Forum 314

NEWS AND TRENDS

How the Investor Looks at Us ..... Chemical Economics 425
Chementator 105
Convention Calendar 293
Editorial Viewpoints 218
Process Industry Trends 428
Chemical Engineering News 265
New Construction 430

PEOPLE AND FIRMS

How to Get Things Done 332
Memo From the Editor 143
Names in the News 342
Readers' Views and Comments 304
J. H. Mathews 342
You and Your Job 332
Industrial Notes 357

LITERATURE AIDS

Quotes, Extracts and Digests 368
Recent Books and Pamphlets 420
Chemical Engineer's Bookshelf 409
Reader Service Section..... Inside Back Cover

July 1952 CHEMICAL ENGINEERING Vol. 59—No. 7
Member ABC and ABP

Published monthly by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948), Founder. **Publication Office 99-129 North Broadway, Albany 1, N. Y.**

Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 West 42nd St., New York 36, N. Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice President; Joseph A. Gerardi, Vice President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice President, Publications Division; Ralph B. Smith, Vice President and Editorial Director; Nelson Bond, Vice President and Director of Advertising; J. E. Blackburn, Jr., Vice President and Director of Circulation.

Subscriptions: Address correspondence to Chemical Engineering—Subscription Service, 99-129 North Broadway, Albany 1, N. Y. or 330 West 42nd St., New York 36, N. Y. Allow ten days for change of address.

Please indicate position and company connection on all subscription orders. Chemical Engineering solicits subscriptions only from supervisory and engineering personnel in companies in which chemical engineering and processing form an important part of the total operation, and from consultants and laboratories whose field includes such process industries.

Single copies 50 cents. Subscription rates—United States and possessions, $3 per year, $4 for two years, $5 for three years; Canada, $4 per year, $6 for two years, $8 for three years; other Western Hemisphere, $15 per year, $25 for two years, $30 for three years; all other countries, single copies $2 each, $20 per year, $30 for two years, $40 for three years. Entered as second-class matter Sept. 3, 1936, at Post Office at Albany, N. Y., under act of March 3, 1879. Printed in U. S. A. Copyright 1952 by McGraw-Hill Publishing Co., Inc. All Rights Reserved.

AUTOMATIC CONTROL EQUIPMENT

ENGINEERED DESIGN BY HAMMEL-DAHL

The Trade Mark of Pioneering Progress...

H-D®

Outstanding Control Valve Features originated by Hammel-Dahl

1. The "DAHL SEAL"® — a frictionless, leak-proof Valve stem SEAL — for any static pressure.
2. ALLSTEEL Superstructure.
3. Bolted packing box — standard.
4. Forged fabricated bonnets and blind heads.
5. Through-bolted bonnets and blind heads — standard.
6. Stainless steel spring stem — standard.
7. Oilite Bearings, friction-free.

Write for your copy of our NEW illustrated Bulletin No. 101

HAMMEL-DAHL COMPANY

175 POST ROAD, (WARWICK) PROVIDENCE 5, R. I., U. S. A.

Albany Boston Buffalo Chicago Cincinnati Cleveland Denver Detroit Houston Kalamazoo Kansas City Kingsport, Tenn. Los Angeles New Orleans New York Pittsburgh Salt Lake City San Francisco Seattle Springfield, Mass. St. Louis Syracuse Toledo Tulsa Wilmington, Del.

MANUFACTURED AND DISTRIBUTED BY: *Canada* — The Guelph Engineering Co., Ltd., Guelph, Ontario • *England* — J. Blakeborough & Sons, Ltd., Brighouse, Yorks. • *France* — Premafrance, Paris

Ethylene Amines

offer you a score of money-making ideas

$H_2NC_2H_4NH_2$

$H_2N(C_2H_4NH)_2H$

$H_2N(C_2H_4NH)_3H$

$H_2N(C_2H_4NH)_4H$

Commercially Available at Low-Cost

Competition is consistent. It demands that you come up with a completely new way of doing things—or an improved product from the old way. Now, you can find all kinds of ideas to help your business with these low-cost ethylene amines:

ETHYLENE DIAMINE . . .
is an intermediate in various organic syntheses, such as production of sequestering agents and manufacture of agricultural fungicides. It is valuable for preparing casein and shellac solutions and in making thermoplastic adhesives and aminophylline.

DIETHYLENE TRIAMINE . . .
is a catalyst activator in the "cold" polymerization of synthetic rubber and a "short stopper" in general synthetic rubber polymerization. It is also used in the vulcanization of foam rubber. This amine is useful as an anti-livering agent in varnishes, as a catalyst for epoxide resins, and as an intermediate for asphalt anti-strippers.

TRIETHYLENE TETRAMINE and TETRAETHYLENE PENTAMINE . . .
are used in making corrosion inhibitors, demulsifying agents, flotation agents, and ion exchange resins.

AMINOETHYL ETHANOLAMINE . . .
is a raw material for the manufacture of emulsion breakers, oil-soluble wetting agents, and textile finishing compounds.

$H_2NC_2H_4NHC_2H_4OH$

START with these ideas for bettering your present product. Look into the new possibilities these ethylene amines suggest. A note or call to any Carbide office will give you the details.

CARBIDE AND CARBON CHEMICALS COMPANY
A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.

Offices in Principal Cities
In Canada:
Carbide and Carbon Chemicals, Limited, Toronto

MAXIMUM CORROSION-RESISTANCE + MAXIMUM ECONOMY

with

LINERS of Boltaron 6200

INERT

NON-TOXIC

RIGID, NON-PLASTICIZED POLYVINYL-CHLORIDE

Liners of Boltaron 6200 can be accurately made to provide complete protection for heavy industrial equipment used in handling highly corrosive materials.

Machinability – Boltaron 6200 is unquestionably the best machinable plastic on the market today. Can be machined to any tolerance within the range of common metals. Will take any type of finish.

Welds easier than steel – easily fused with low temperature hot air torch.

Extrusions available – solid bar stock, 10′ lengths, ⅜″ to 1½″ in diameter. Pipe in standard iron pipe sizes ½″ to 4″ i.d., 10′ and 20′ lengths . . . can be threaded with ordinary pipe dies.

Sheet stock – in sizes approximately 30″ x 60″ – 1/32″ to 1″ thick.

AVAILABILITY – Distribution is limited to selected fabricators trained by the Hartwell Company. This ensures that your fabricator will make efficient and economical use of Boltaron 6200. Trained fabricators have already been licensed and established on West Coast, East Coast and in Central States area. All inquiries are processed by the Hartwell Company to ensure that the right fabricator is assigned to a given job. For further details, write to our home office, address below.

PARTIAL LIST OF USES

- Electroplating
- Anodizing
- Dyeing & Bleaching
- Tanning
- Brewing
- Food Processing
- Dairy Products Processing
- Textile Processing
- Photographic Processing
- Industrial Plumbing

•

Boltaron 6200 is
manufactured by
BOLTA, Lawrence, Mass.

H. N. HARTWELL & SON, INC.

Industrial Plastics Division • *Park Square Building, Boston 16, Mass.*

News about

B. F. Goodrich Chemical *raw materials*

TEST DATA ON CHEMICAL RESISTANCE OF GEON RESIN 404

THE table here gives you new and additional information about the properties of Geon Resin 404. Designed for rigid applications, its outstanding chemical resistance makes it ideal for uses where corrosion is a problem—and where rigidity and tensile strength are important. Typical examples of such uses are fume hoods and duct work, tanks for corrosive chemicals, metal tank liners. In addition, Geon 404 is suitable for trays, funnels, buckets, etc.

Geon 404 possesses all the excellent properties of straight polyvinyl chloride, *and* can be processed without plasticizer addition on standard equipment. In addition to its outstanding chemical resistance, Geon 404 also provides exceptional strength coupled with light weight, and excellent electrical properties. For further information, please write for Bulletin G-6, Dept. GF-4, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. In Canada: Kitchener, Ontario. Cable address: Goodchemco.

CHEMICAL RESISTANCE OF GEON RESIN 404

Original Properties of a Plastic Containing Geon Resin 404 and a Tin Stabilizer

Ultimate Tensile Strength (psi)	8700
Ultimate Elongation (%)	11

PROPERTIES AFTER 30-DAY IMMERSION

IMMERSION MEDIA	ROOM TEMPERATURE		60° C	
	Tensile (psi)	Elong't'n (%)	Tensile (psi)	Elong't'n (%)
Air Oven	—	—	9800	12
INORGANIC ACIDS				
Sulfuric Acid 20%	8500	12	10,000	12
Sulfuric Acid 80%	8900	12	9000	14
Hydrochloric Acid 30%	8600	10	9800	12
Nitric Acid 60%	8500	12	9000	12
Phosphoric Acid 75%	8600	10	10,100	11
ALKALI SOLUTIONS				
Sodium Hydroxide 10%	8600	11	9600	12
Sodium Hydroxide 50%	9100	11	10,000	11
SATURATED SALT SOLUTIONS				
Barium Sulfide	8400	11	9700	12
Calcium Hypochlorite	8400	11	9800	12
Tri Sodium Phosphate	8400	11	9700	12
Sodium Dichromate	8600	11	8600	12
ORGANIC ACIDS				
Acetic Acid 80%	8100	10	9500	12
Acetic Acid Glacial	7800	12	3000	10
Oxalic Acid Sat.	8600	12	9800	12
Citric Acid Sat.	8500	10	9800	11
Stearic Acid 100%	—	—	9500	11
ALCOHOLS				
Ethyl Alcohol	8400	11	6400	12
Butyl Alcohol	8700	11	8600	12
Amyl Alcohol	8600	11	9200	13
Ethylene Glycol	8700	11	9800	11
Glycerin	8700	10	9800	12
HYDROCARBONS				
Lubricating Oil ASTM #1	8400	10	9800	11
Lubricating Oil ASTM #2	8500	12	9800	13
Lubricating Oil ASTM #3	8600	12	9800	12
Gasoline 70 Octane	8400	11	—	—
Gasoline 100 Octane	8800	11	—	—
Hexane	8600	11	—	—
Kerosene	8700	11	—	—
Linseed Oil	8800	11	10,100	12
Castor Oil	8300	12	10,000	12
Cottonseed Oil	8500	12	9700	13
ORGANIC SOLVENTS				
Trichloro Ethylene	8800	11	10,000	11
Carbon Tetrachloride	8800	11	2100	190
Benzene	1700	140	Gelatinous	Gelatinous
Turpentine	8700	10	9200	11
Stoddards Solvent	9000	10	10,200	11
MISCELLANEOUS				
Hydrogen Peroxide 50%	9400	10	10,800	11
Formaldehyde	8300	10	9900	12
Triethanol Amine	5300	180	3000	130
Phenol	—	—	4800	120

GEON RESINS • GOOD-RITE PLASTICIZERS ... the ideal team to make products easier, better and more saleable.

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON organic colors

IN PLANNING *Your*

CONTINUOUS PROCESSES

INCLUDE

STRAIGHT LINE FLOW Valve Advantages

CASH STANDARD
Streamlined TYPE 1000
PRESSURE
REDUCING VALVES

Streamlined flow of steam, air, oil, etc., around the inner valve is an immediate solution to the important need of dependable control under varying loads.

Continuous processes can be dependably protected against slow downs, failures, and maintenance ordinarily due to valve inefficiencies. The STREAMLINED "1000" Valve with ample capacity, tight closing characteristics, close delivery pressure control, and with a wide range of adjustment makes possible speedier production, smooth operation and no spoilage.

You get straight line flow which eliminates turbulence so that at all times you are easily able to meet peak demand and yet hold the reduced pressure constant at the same time. For the complete facts write for Bulletin "1000."

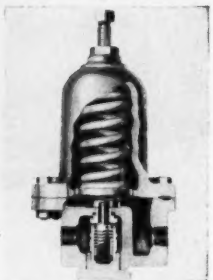
The inner valve fits right in the line as though a part of it

What might be mistaken for a pipe running through the phantom Streamlined Valve above is really the housing which contains the inner valve. Through it you have the Straightline Flow that brings such enthusiastic comments as voiced by many users.

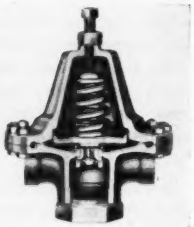
CASH STANDARD CONTROLS.. VALVES

A. W. CASH COMPANY
DECATUR, ILLINOIS

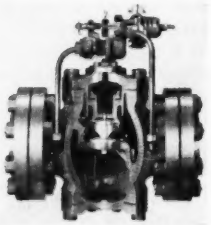
BULLETINS AVAILABLE ON OTHER CASH STANDARD VALVES
Send for them



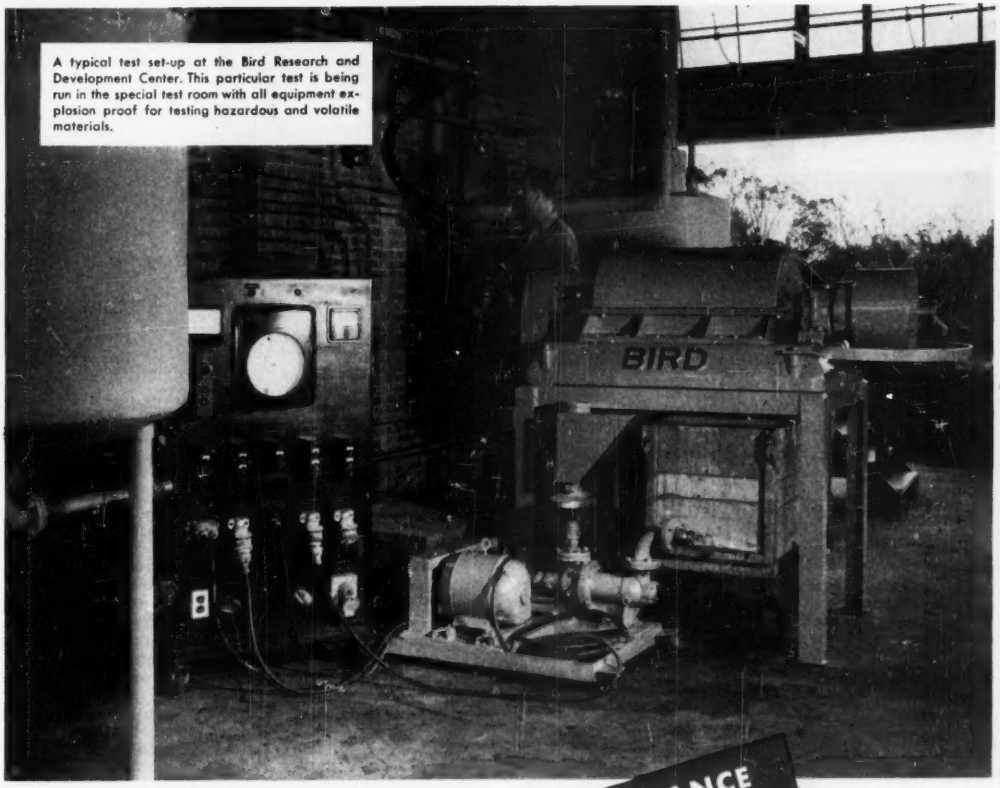
High Pressure Reducing Valve Type H-P; extra heavy for use with initial pressures up to 5000 lbs.; and for reduced pressures up to 650 lbs. Good for most fluids. Sizes: ¾" to 2"; bronze body; nitralloy trim. Get Bulletin 931.



Type 8871 Pressure Regulator for dirty liquids (like Bunker C fuel oil). Inner valve is bolted to diaphragm for positive movement. Sizes ½" to 10". Bodies: iron, bronze, or steel. Seat ring and inner valve; stainless steel. Bulletin 972.



Cash Standard Type 10 Pressure Regulating Valve, pilot operated. (Pilot operating fluid discharges to outlet pipe; not wasted). Sizes: 2" to 12". Highest pressures: inlet 600 lbs.; reduced 250 lbs. Iron, bronze, or steel bodies; standard trims. For water, air, non-corrosive gases and oils. Get interesting Bulletin 966.



A typical test set-up at the Bird Research and Development Center. This particular test is being run in the special test room with all equipment explosion proof for testing hazardous and volatile materials.

GET THE FACTS ON FILTER PERFORMANCE CAPACITY COST BEFORE YOU BUY

Before you buy any *type* of filtration equipment or any *make* of filter, you should have complete, authentic information on —

how effectively it will do the job,
how much it will handle per hour or per day,
how well it will wash,
how it fits into your flow sheet and floor space,
what it costs to buy, install, operate and maintain.

The Bird Research and Development Center is set up to give you the facts, quickly, surely and without prejudice for Bird builds a wide range of separation equipment.

Before you buy a filter — any filter — it's an easy matter to arrange for test findings, usually without cost, always without obligation on your part.

BIRD MACHINE COMPANY
South Walpole · Massachusetts

Photograph of a section of a failed tube showing excessive thinning and pitting of the outer surface. Note also the circumferential cracks.

CORROSION STUDIES CAN INCREASE THE ECONOMY OF COPPER ALLOYS

Copper and its alloys are notable for their resistance to corrosion under a wide variety of conditions. There are industrial applications where copper or the appropriate copper alloy should give an indefinitely long life, but where failure because of corrosion may result by reason of unsuitable design of equipment or improper control of environment. Further, there are many situations in which no commercial metal or alloy will have an extended life, but in which copper or one of its alloys possesses a combination of physical and chemical properties which render it the best obtainable material, when all factors, including ultimate costs, are taken into consideration. Hence correct specification becomes of great importance. Recognition of this by industry is responsible for the fact that the Revere Research Department devotes so much time to studying the corrosive effects of fluids and gases, and to preventive measures.

Recently a large manufacturer, who produces condensers as well as other equipment, reported that arsenical Admiralty tubes in a steam-jet ejector were failing after five years. This length of service is not too bad, but nevertheless such tubes often last much longer. Could we make any suggestions?

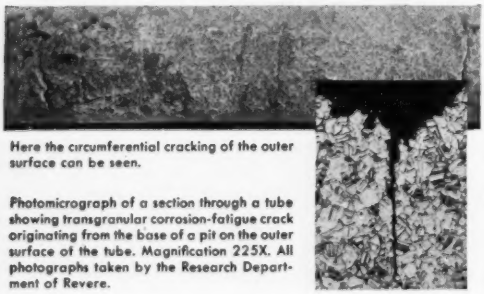
Seven failed tubes were examined for type of corrosion, metal and scale analysis. The facts were: outer surfaces were badly pitted and grooved with holes completely through in some areas; the inside surfaces were relatively untouched; cracking was circumferential, progressing from the outside; outer scale was largely cupric carbonates and copper sulfide; inner scale was calcium carbonate, cuprous oxide and some iron oxide. Microscopic examination of the cracks showed they originated in corrosion pits on the outside, progressing inward across grain boundaries, rather than along them. The transgranular path of fracture, together with other characteristics of the microstructure, definitely established the fact that the failure was of the corrosion-fatigue type. The corroding pits on the outside created stress concentration points of weakness, from which the cracks originated. Eventually the localized stress exceeded the endurance limit of the metal and it cracked.

The conclusion was, therefore, that damage was from two sources—the first being excessive carbon dioxide and the other non-condensable gases in the steam, which caused the excessive pitting and thinning. It is not ununusual to have these and other corrodants present in damaging amounts in the air-ejector system, whereas they are not injurious elsewhere. The second cause of failure was excessive vibration somewhere in the unit which was responsible for the corrosion fatigue failure.

RECOMMENDATIONS. The copper-base tube alloy that generally possesses the greatest resistance to the non-condensable gases responsible for the corrosion of the Admiralty tubes is 5% aluminum bronze. Re-tubing with this was suggested. It was also recommended that steps be taken to effect a material reduction in tube vibration by placing a baffle in the steam inlet. In addition, it was pointed out that many operators find it good practice to discharge the after-condenser drain to the sewer instead of returning it to the system. By this means, the amount of carbon dioxide, ammonia and other gases in the system can be substantially decreased.

* * *

It is interesting to note that the Revere Research Department, located in Rome, N. Y., was able to determine these causes and suggest remedies without ever having seen the condenser. This is the result of modern equipment, and long experience in studying the problems of corrosion. If you have a problem regarding the corrosion of copper and copper alloys, or aluminum alloys, why not take it up with the nearest Revere office? Remember, corrosion that is too rapid wastes both your money and our national resources.

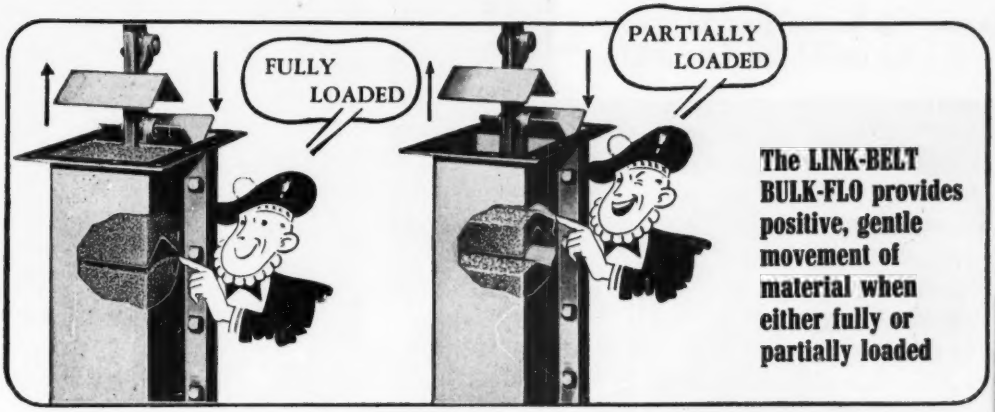


Here the circumferential cracking of the outer surface can be seen.

Photomicrograph of a section through a tube showing transgranular corrosion-fatigue crack originating from the base of a pit on the outer surface of the tube. Magnification 225X. All photographs taken by the Research Department of Revere.

REVERE
COPPER AND BRASS INCORPORATED
Founded by Paul Revere in 1801
230 Park Avenue, New York 17, N. Y.
* * *
Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere
SEE REVERE'S "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY

Combined feeder · conveyor · elevator cuts your handling costs



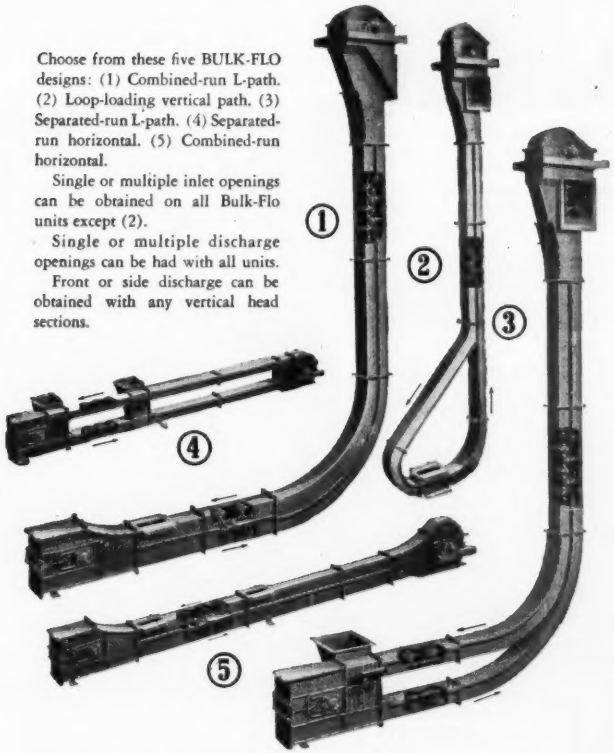
The LINK-BELT BULK-FLO provides positive, gentle movement of material when either fully or partially loaded

Choose from these five BULK-FLO designs: (1) Combined-run L-path. (2) Loop-loading vertical path. (3) Separated-run L-path. (4) Separated-run horizontal. (5) Combined-run horizontal.

Single or multiple inlet openings can be obtained on all Bulk-Flo units except (2).

Single or multiple discharge openings can be had with all units.

Front or side discharge can be obtained with any vertical head sections.



BULK-FLO gives you true versatility in bulk materials handling . . . at lower cost. It replaces several units in less space . . . cuts initial outlay. And because solid flights operate independently of internal pressure, BULK-FLO can be operated at less than full capacity, with positive movement of materials.

That means capacity can be varied by regulating the feed. It also means gentler handling —material is protected in individual "compartments" to minimize degradation.

And note this—regardless of the amount of material being fed, BULK-FLO is self-clearing through intermediate runs. This feature allows you to alternate batches of different materials and prevents contamination.

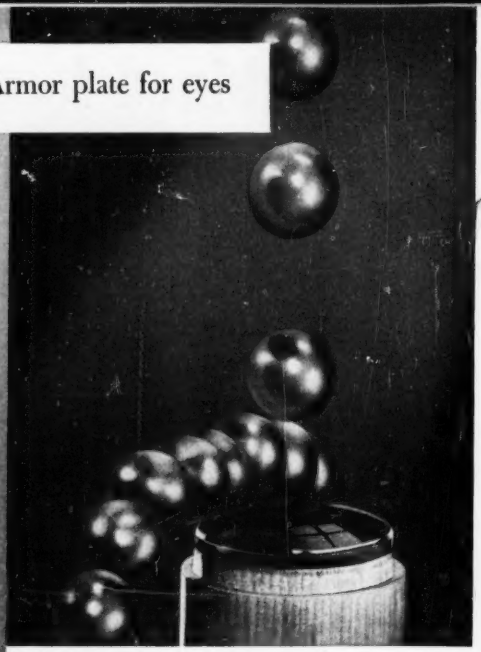
You can get complete information on BULK-FLO from the Link-Belt office near you. Or write for your copy of Book 2175.

LINK-BELT

BULK-FLO
FEEDERS - CONVEYORS - ELEVATORS

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in Principal Cities. 12,882-N

PROBLEM: Armor plate for eyes

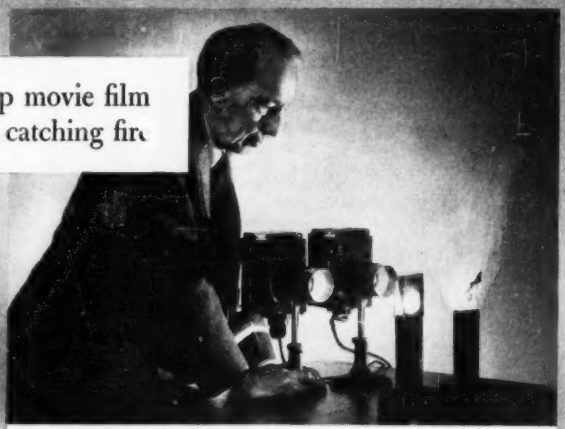


ANSWER: If you dropped steel balls on *your* glasses, they'd shatter in dangerous splinters. AO safety-goggle lenses won't splinter. Scientists at American Optical devised a heat treatment that makes glass many times as strong, eyes safer.

PROBLEM: A hemoglobin laboratory for use at patient's bedside

ANSWER: Today, a physician need not send blood samples to a laboratory for hemoglobin analysis and delay diagnosis. Within 3 minutes, he can read the answer in the Hb-Meter. This meter is so fast that a patient's condition can be watched during treatment. Heart of the instrument is an accurately polished glass wedge, graded in color, against which the blood sample can be matched. The Hb-Meter is a creation of American Optical Company.

PROBLEM: To keep movie film from catching fir



ANSWER: *Right,* film shielded by ordinary glass catches fire. *Left,* AO heat-absorbing glass prevents fire. This glass, developed for floods and projectors, absorbs 90% of heat from projected light, passes movie-film color in true values. Write us about your development problems. American Optical Company, 59 Vision Park, Southbridge, Mass.

American Optical

Only B. F. Goodrich makes the grommet belts that cut costs 20 to 50%!

Save 3 ways! Investigate today! Write or mail coupon

You save belt costs because belts last longer, save production costs because machines keep running with fewer interruptions, save maintenance costs because they need less attention.

Patented grommet belts by B. F. Goodrich represent the only basic change since invention of the V belt. Belts last 20 to 50 per cent longer, depending on service. (The more severe the service, the greater the increase over ordinary belts.) Grommet belts have more rubber; they're more flexible, give better grip, less slip.

What is a grommet?

A grommet is like a giant cable except that it's *endless*—a cord loop built up by winding heavy cord on itself. There is no overlapping cord *section* as in all ordinary belts. Most belt failures occur in these sections where cords overlap!

All cords put to work

Each of the two grommets and every part of a grommet carry their share of the load. In ordinary belts under high tension the center cords "dish" because tension is greater near the driving faces. Dished cords are doing less work, not pulling their share. Grommet belts have no center cords, there is no dishing—therefore much more strength in proportion to cord volume—and less stretch. Grommet belts stretch, on an average, only about one-third as much as ordinary belts.

Better grip, less slip

Grommet belts have more rubber in relation to belt size. Without any stiff overlap, they're more flexible, grip pulleys better. Size for size, grommet belts give ⅓ more gripping power, pull heavier loads with a higher safety factor. Because there is less slip, there is also less surface wear.

Send for proof

Send the coupon for a set of reports telling users' experiences and showing actual installations where grommet belts outlasted all others. Some typical cases:

"... within a few days ordinary belts had stretched ... After six months of 24-hour-a-day service BFG grommet belts haven't stretched at all ..."

"Ordinary belts lasted only 5 or 6 weeks ... B. F. Goodrich grommet belts are in their sixth month of service ..."

"Previous belts suffered from shock loads, wore out fast ... BFG grommet belts have been in service 2 years with no shut-downs..."

There are hundreds of cases like these.

They cost no more

BFG grommet belts cost not one cent more than others. The savings they make for you are clear profit. They are made in C, D and E sections. They are patented by B. F. Goodrich. No other V belt is a grommet belt (U. S. Patent No. 2,233,294).

Write, send the coupon or see your B. F. Goodrich distributor. (He will show you his "X-ray" belt that shows the grommet construction clearly.)

Grommet V Belts BY

B.F.Goodrich

FIRST IN RUBBER

The B. F. Goodrich Company
Dept. CE-7
Akron, Ohio

☐ Send set of reports telling users' experiences and showing actual installations proving that B. F. Goodrich grommet belts outlast all others.

☐ Have distributor show me the "X-ray" belt that shows how B. F. Goodrich grommet belts are made.

Name_____

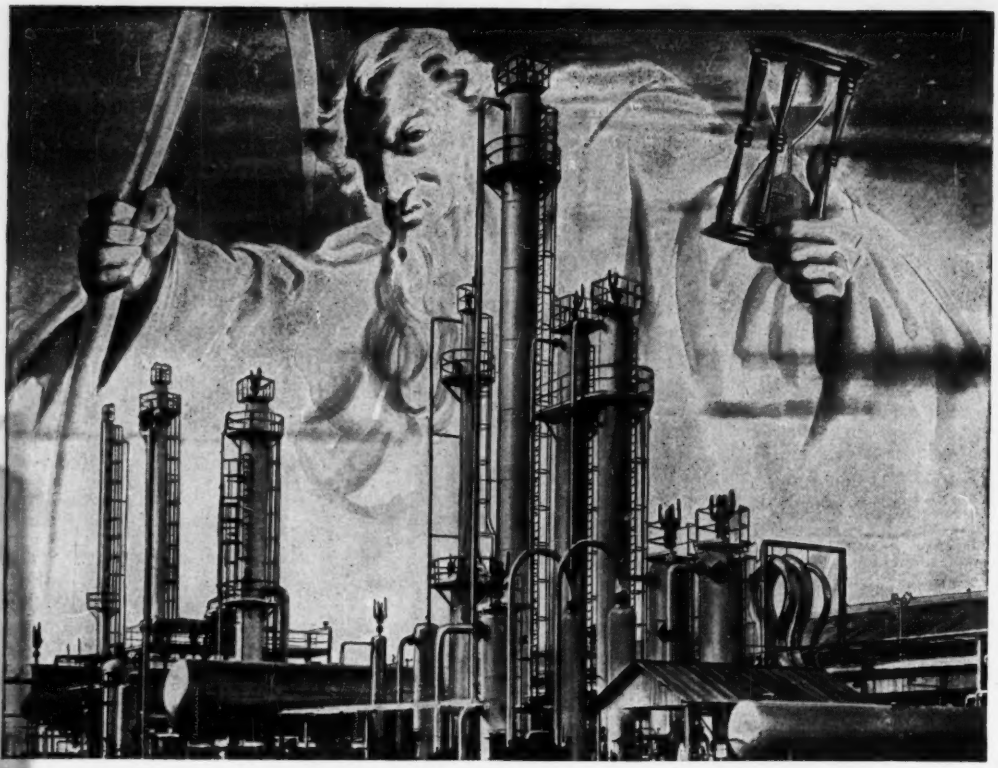
Firm Name_____

_____

Street Address_____

City_____

State_____



Since 1929, A. O. Smith has been helping the petroleum, Petro-chemical, chemical and paper industries solve many of their difficult corrosion problems.

The Ultimate JUDGE is TIME

Smithlined vessels have been in continuous corrosive service for over 20 years without failure of the lining attachment or the vessel itself.

This history of service is significant. It confirms the findings of our own research laboratories and supports the designs of our engineers, that closely controlled resistance-welding of stainless or other corrosion resistant liners to carbon steel vessel walls is the best means of providing long-term service and satisfactory performance under specific corrosion, pressure and temperature conditions.

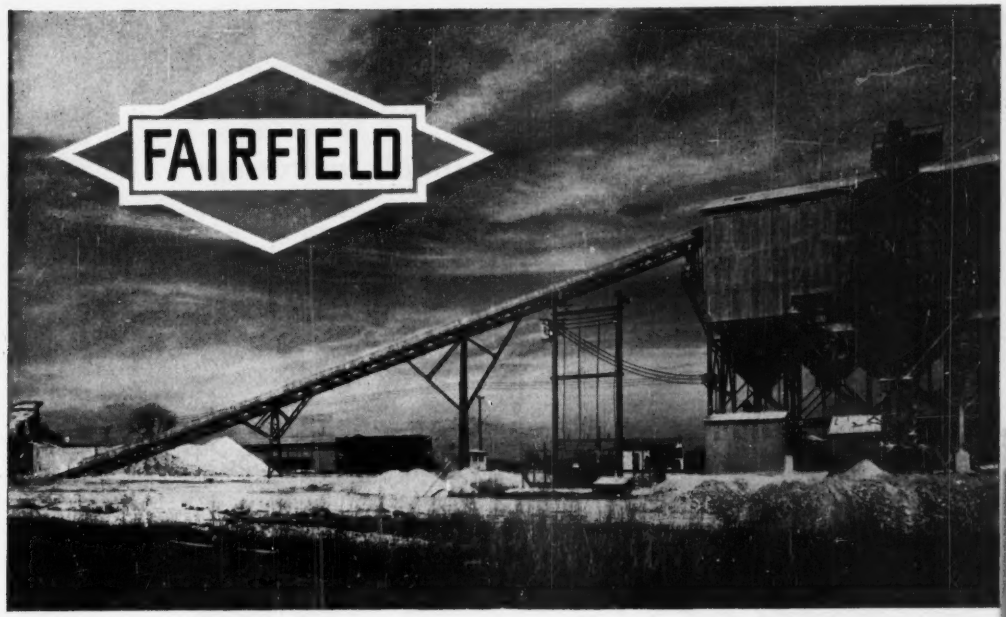
If you have a corrosion problem, let A. O. Smith work with you in solving it. Our engineers and laboratories have an unequalled background of experience and data gained from hundreds of successful applications of Smithlining. Contact our nearest district office.

78th ANNIVERSARY 1874 - 1952

A.O.Smith

VESSELS • HEAT EXCHANGERS

Boston 16 • Chicago 4 • Cleveland 15 • Dallas 2 • Denver 2
Houston 2 • Los Angeles 22 • Midland 5, Texas • New Orleans
New York 17 • Philadelphia 3 • Pittsburgh 19 • San Francisco 4
Seattle 1 • Tulsa 3 • Washington 6, D.C.



Carries the Load for WYANDOT DOLOMITE

Fairfield Conveyor Systems work around the clock for Wyandot Dolomite, Inc., Carey, Ohio, in handling and processing dolomite.

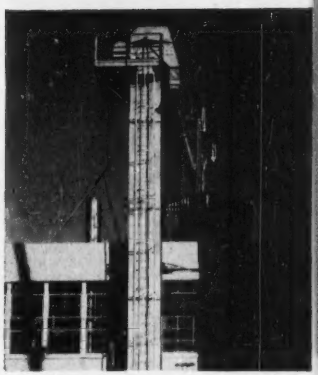
A typical example of the many rugged material handling jobs assigned to Fairfield, these systems utilize every component in the bulk material handling field to bring you economical operating costs by eliminating costly old-fashioned material handling methods. Then too, responsibility for the complete handling system rests with one source—for Fairfield designs, fabricates and installs the complete job.

Check with this outstanding organization on your bulk material handling needs today. Bulletin 152, describing Fairfield Systems, is available on request. Write the Contract Division, Fairfield Engineering Company, Marion, Ohio.

THE FAIRFIELD ENGINEERING COMPANY
349 Chicago Ave., Marion, Ohio

FAIRFIELD

Specialists in bulk material handling

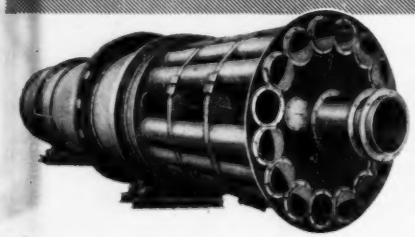


Centrifugal discharge type elevator designed and built by Fairfield at a modern processing plant.

One of a great variety of Fairfield Belt Conveyors at work in an eastern chemical plant.

This simple microscope . . .

was the key that unlocked many of nature's secret doors. With facts to work with, scientists soon discovered many ways to advance industrial techniques and processes.



Standard Traylor Rotary Coolers are built in 3 types to meet practically all requirements. Special coolers are "Traylormade" by our experienced engineers to solve problem applications. See Bulletin 115 for specifications and description.

As scientific research continually raised material standards, better machinery was needed to apply new methods to volume production. For a good part of our 50 years, Traylor has been building specialized equipment for the chemical processing industries. There's no substitute for experience in solving new production problems. Traylor has experience . . . half a century of it.

OUR GOLDEN ANNIVERSARY YEAR
1902 1952

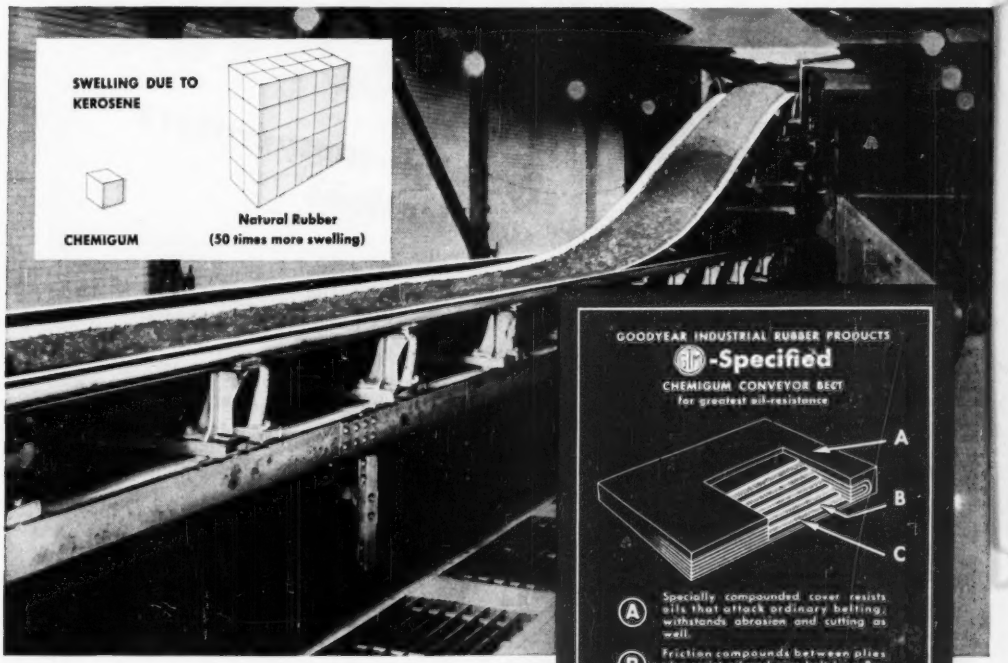
TRAYLOR ENGINEERING & MANUFACTURING CO.
451 MILL ST., ALLENTOWN, PA.
SALES OFFICES: New York • Chicago • San Francisco • Los Angeles.
Canadian Mfr.: Canadian Vickers, Ltd., Montreal, P. Q.

a **Traylor** *leads to greater profits*

Here's the LONGEST-LASTING BELT for handling Oily Materials

HERE's graphic evidence of the oil resistance built into the covers and carcass of CHEMIGUM conveyor belts—designed by the G.T.M.—Goodyear Technical Man—for use in service where severe oil and grease conditions cause premature failure of conventional belts.

Tests with kerosene show that Goodyear's oil-resistant CHEMIGUM covers swell only 2% as much as high grade conveyor covers made from natural rubber. (See Chart.) CHEMIGUM will also resist oil far better than many other oil-resisting synthetics used in belts. When destructive effects of such solvents are present, consult the G.T.M. for full details, or write Goodyear, Akron 16, Ohio.


SWELLING DUE TO KEROSENE
CHEMIGUM
Natural Rubber (50 times more swelling)
GOODYEAR INDUSTRIAL RUBBER PRODUCTS
GT-Specified
CHEMIGUM CONVEYOR BELT for greatest oil-resistance
A
B
C
A Specially compounded cover resists oils that attack ordinary belting, withstands abrasion and cutting as well.
B Friction compounds between plies also resist oil and give belt long flex life.
C Plies of duck reinforcement to fit individual job requirements.

LOOK FOR YOUR GOODYEAR INDUSTRIAL RUBBER PRODUCTS DISTRIBUTOR *in the yellow pages of your Telephone Directory under "Rubber Products" or "Rubber Goods." He handles Hose, Flat Belts, V-Belts, Molded Goods, Packing, Tank Lining, Rubber-Covered Rolls built to the world's highest standard of quality.*

GOODYEAR

THE GREATEST NAME IN RUBBER

Chemigum—T.M. The Goodyear Tire & Rubber Company, Akron, Ohio

take a
CLOSER LOOK at

B&W ALLOY TUBING

for high-temperature applications

- CARBON MOLY
- CROLOY ½
- CROLOY 1¼
- CROLOY 2
- CROLOY 2¼
- CROLOY 3-M
- CROLOY 5
- CROLOY 5-Si
- CROLOY 7
- CROLOY 9-M

All of these intermediate alloys, developed expressly for high temperature services, are being used extensively in a wide variety of chemical processing applications. All have earned universal acceptance and praise for giving optimum service satisfaction with economy over the years.

The table on the opposite page shows the extensive range of temperature, pressure, corrosion and oxidation conditions met by B&W Alloy Tubing. Technical data on these analyses is contained in Bulletin TB-12, available upon request. Call on Mr. Tubes—your B&W Tube Representative—to get the benefit of the extensive tubing service he represents, on your specific tubing problems.

You May Want to Save This Condensed Data on
B&W ALLOY TUBING
For Future Reference

B&W	NOMINAL ALLOY CONTENT	MAXIMUM SERVICE TEMPERATURE	APPLICATIONS
Carbon-Moly	0.50% Mo	1050F	For service conditions requiring higher creep strength than carbon steel with no increase in corrosion or oxidation resistance.
Croloy ½	0.60% Cr 0.50% Mo	1075F	For operating conditions requiring properties superior to Carbon Moly with respect to graphitization and creep strength. Used primarily for high temperature steam piping.
Croloy 1¼	1.25% Cr 0.50% Mo 0.75% Si	1100F	Economic grade good creep strength properties. Somewhat more corrosion resistant than the chromium free steels.
Croloy 2	2% Cr 0.50% Mo	1150F	Economic grade for resisting both oxidation and corrosion, with excellent high-temperature strength.
Croloy 2¼	2.25% Cr 1.00% Mo	1175F	Exceptionally high creep strength for polymerization and high pressure cracking. Otherwise similar in properties and characteristics to Croloy 2.
Croloy 3-M	3% Cr 0.90% Mo	1175F	Somewhat better creep properties and better resistance to corrosion and oxidation than Croloy 2.
Croloy 5	5% Cr 0.50% Mo	1200F	For operating conditions where corrosion resistance is a primary requirement—provides good creep strength and oxidation resistance superior to Croloy 2.
Croloy 5-Si	5% Cr 0.50% Mo 1.50% Si	1300F	For operating conditions where oxidation resistance is a primary requirement. Excellent resistance to scaling under straight oxidizing conditions.
Croloy 7	7% Cr 0.50% Mo 0.50-1.00% Si	1250F	Intermediate steel between Croloys 5 and 9 for operating conditions where corrosion resistance is the primary requirement. Somewhat more oxidation resistant than Croloy 5.
Croloy 9-M	9% Cr 1% Mo	1300F	For severe operating conditions where high corrosion and oxidation resistance are essential—suitable for hydrogenation processes.

Steels from CROLOY 1¼ upward are electric furnace melted alloy steels which are normally cleaner and of better quality than those melted in the open hearth. This contributes to greater reliability and improved creep properties at elevated temperatures.

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION
General Offices & Plants
Beaver Falls, Pa.—Seamless Tubing; Welded Stainless Steel Tubing
Alliance, Ohio—Welded Carbon Steel Tubing
Sales Offices: Beaver Falls, Pa. • Boston 16, Mass. • Chicago 3, Ill.
Cleveland 14, Ohio • Denver 1, Colo. • Detroit 26, Mich. • Houston 19, Texas
Los Angeles 17, Cal. • New York 16, N. Y. • Philadelphia 2, Pa.
St. Louis 1, Mo. • San Francisco 3, Cal. • Syracuse 2, N. Y.
Toronto, Ontario • Tulsa 3, Okla.

TA-1685T

America's Flagship . . .

The S. S. UNITED STATES

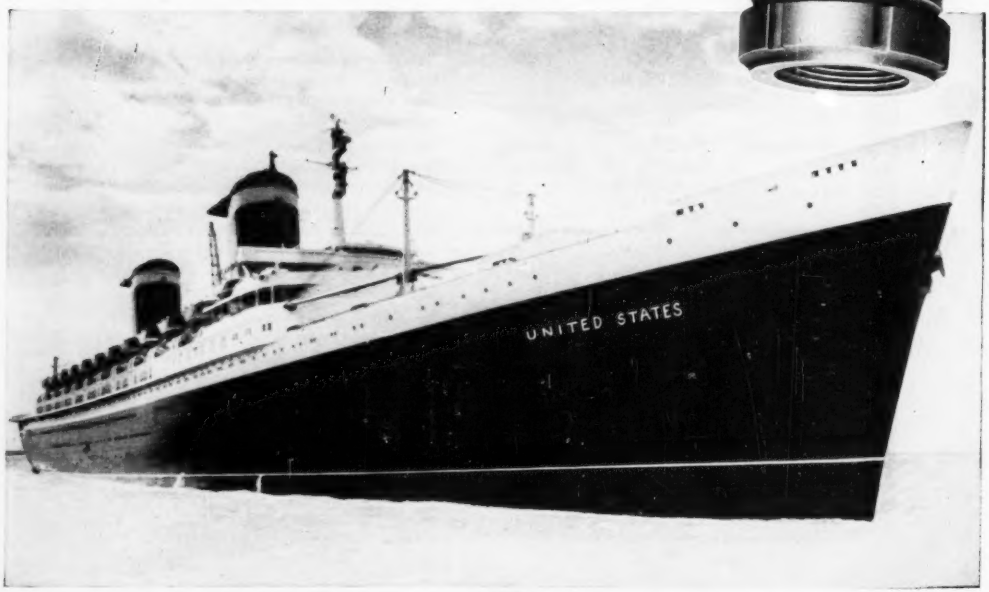
. . . a $70,000,000 investment protected by REPUBLIC FIRE HOSE

This luxuriously appointed goliath is the largest steamship ever built in our country. It is also one of the world's largest structures of any kind—afloat or ashore!

Designed by the famous naval architects, Gibbs & Cox, Inc., and built by the country's foremost shipbuilders, Newport News Shipbuilding and Dry Dock Company, the S.S. United States will soon be ready to challenge all comers for speed, comfort and safety of travel across the North Atlantic.

Republic Rubber is proud to have served the builders of this great ship. The thousands of feet of Republic Fire Hose selected for duty aboard this vessel will provide the highest degree of safety for passengers, crew and cargo.

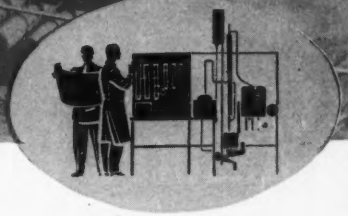
We hope the hose never sees action. But should necessity arise you can bet it'll turn in an outstanding performance—typical of all Republic Industrial Rubber Products!



INDUSTRIAL RUBBER PRODUCTS BY
REPUBLIC RUBBER DIVISION
Lee Rubber & Tire Corporation
YOUNGSTOWN, OHIO

• The supership United States is built to carry 2,000 passengers, a 1,000-man crew and to convert, if necessary, into a transport for 14,000 troops. Secret features of design enable the 4½-block long leviathan to steam 10,000 miles without refueling. The Republic Fire Hose used on this installation is built with long-lasting rubber tube surrounded by a double jacket of flawless cotton fabric.

Helping to Build this Chemical Century!



Chemical Plants Division is contributing much to the history of modern industrial chemistry . . .

by designing, and constructing complete chemical plants—both large and small.

through original developments in many fields of chemical technology.

by cooperating with scientists and engineers in the continuous search for new techniques, better processes.

by supplying the experience and team-work necessary to convert pilot plant performance into full-scale operation.

We welcome the opportunity to sit down with your engineers and technicians to discuss how we may best help you.

CHEMICAL PLANTS DIVISION offers you competent experience in

CHEMICAL PROCESSES—Processing plants designed and constructed in accordance with the client's data.

CHLOR-ALKALI—Complete chlorine and caustic soda plants employing the Mathieson Mercury Cell Process.

FATS AND OILS—Units for the extraction and processing of fats and oils into edible and industrial products.

LOW TEMPERATURE PROCESSES—Plants for the separation of gases into their components by processes of Gesellschaft fuer Linde's Eismaschinen.

OIL AND GAS—Gas compressor and treating plants; facilities for distillation, cracking, reforming, polymerization and refining of petroleum.

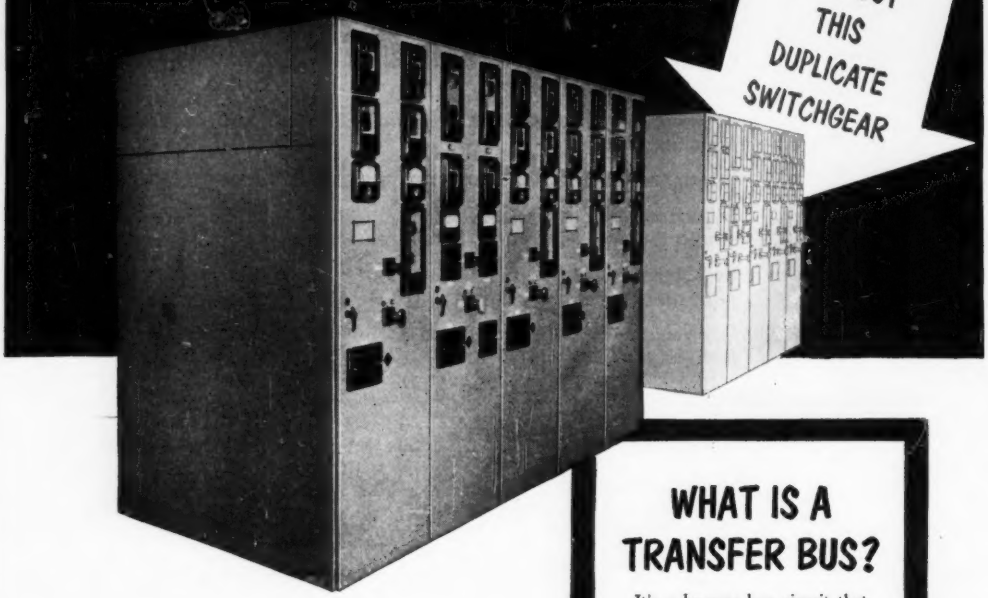
RESINS AND PLASTICS—Plants to produce resins such as alkyd, phenolic, urea, melamine, vinyl, polystyrene, copolymer, and special resins.

SYNTHETIC FUELS AND CHEMICALS—Production of synthetic hydrocarbons and oxygenated compounds based on Fischer-Tropsch, Oxo, and Oxyl syntheses.

BLAW-KNOX CONSTRUCTION COMPANY
CHEMICAL PLANTS DIVISION
930 DUQUESNE WAY, PITTSBURGH 22, PA.
Tulsa 1 • New York 17 • Philadelphia 3 • Chicago 1 • Birmingham 3 • Washington 5, D.C.

ALLIS-CHALMERS METAL-CLAD

Switchgear ..With Transfer Bus Assures Power Continuity



Saves 1/3 the Cost

You pay only for the addition of the transfer bus . . . not a complete set of duplicate switchgear with all of its expensive components. At least one-third is saved on entire installation.

Saves 1/2 the Space

Allis-Chalmers supplies transfer bus in same cubicle as switchgear, without adding cubicles . . . thus cutting floor space one-half.

WHAT IS A TRANSFER BUS?

It's a by-pass bus circuit that parallels the main switchgear bus . . . with means provided for switching loads to the transfer bus. Also makes it possible to withdraw and maintain circuit breakers, or inspect main bus without power outage. This method proved by utilities in hundreds of installations.

Ask an Allis-Chalmers engineer about transfer bus arrangements and what they can mean to your plant in savings and service. And learn too about the unusual features that make it so easy to install A-C switchgear. Call your nearby Allis-Chalmers district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-3773

ALLIS-CHALMERS A-C ALLIS-CHALMERS

our newest in synthetic polymers

FUMEX

the fume resistant
WHITE enamel that stays WHITE!

INFORMATION FOR EXECUTIVES AND ENGINEERS

MOST RESISTANT . . . to acid, alkali and sulfide fumes, minimum of fading and reaction (see test proofs on photos).

INTERIOR SURFACES ONLY . . . for brick, concrete, plaster, wood, metal. All surfaces to be treated first with Fumex undercoater.

WHITE ONLY . . . supplied in white only, semi-gloss finish.

WASHABLE . . . withstands washings at regular intervals.

APPLICATION . . . brush or spray.

ACID TEST
Discs were placed face down over beaker of concentrated Hydrochloric Acid for 24 hours.

ALKALI TEST
Discs were placed face down over beaker of concentrated Ammonium Hydroxide for 24 hours.

SULFIDE TEST
Discs were placed face down over beaker of concentrated Ammonium Sulfide for 24 hours.

FUME RESISTING ENAMEL A

FUME RESISTING ENAMEL B

FUMEX

A DEVELOPMENT OF THE HORN RESEARCH LABORATORIES

HORN

A. C. HORN COMPANY, Inc. est. 1897

Manufacturers of materials for building maintenance and construction
LONG ISLAND CITY 1, N. Y. • Los Angeles • San Francisco • Houston
Chicago • Toronto SUBSIDIARY OF SUN CHEMICAL CORP.

A. C. HORN COMPANY, INC., Long Island City 1, N. Y. BI-2

Please send me ☐ complete data on FUMEX

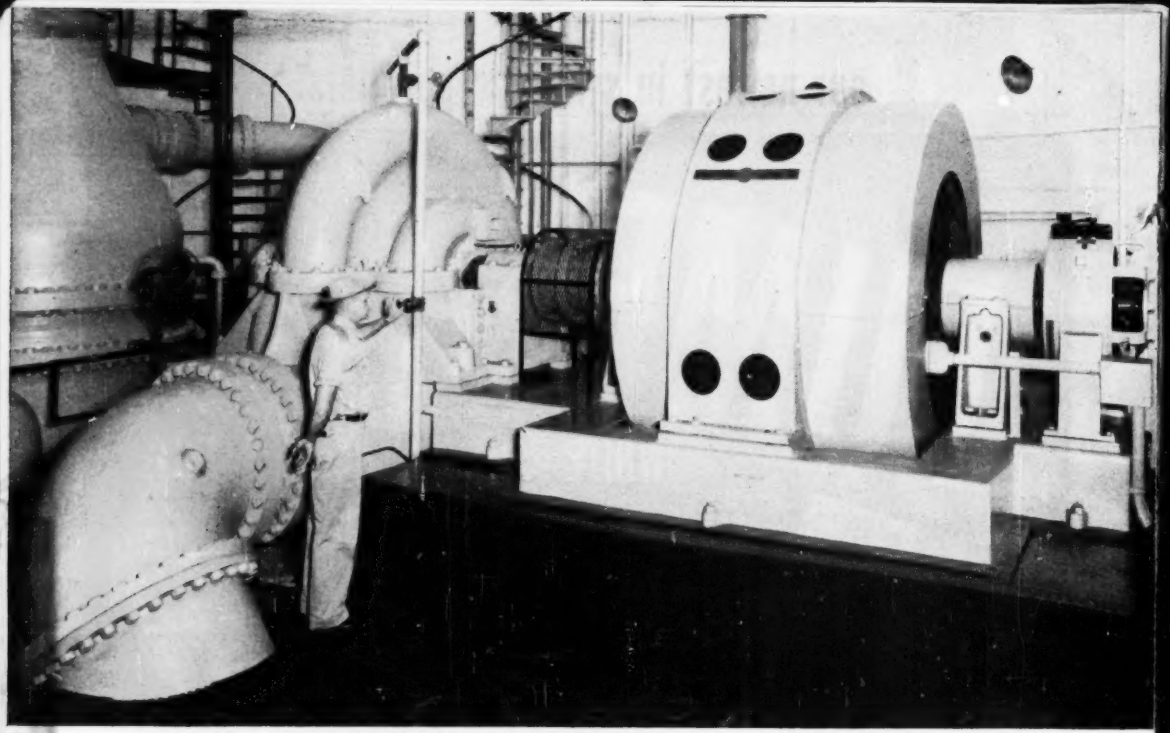
HORN ☐ free copy of your 96-page Construction Data Handbook

NAME_____ TITLE_____

FIRM NAME_____

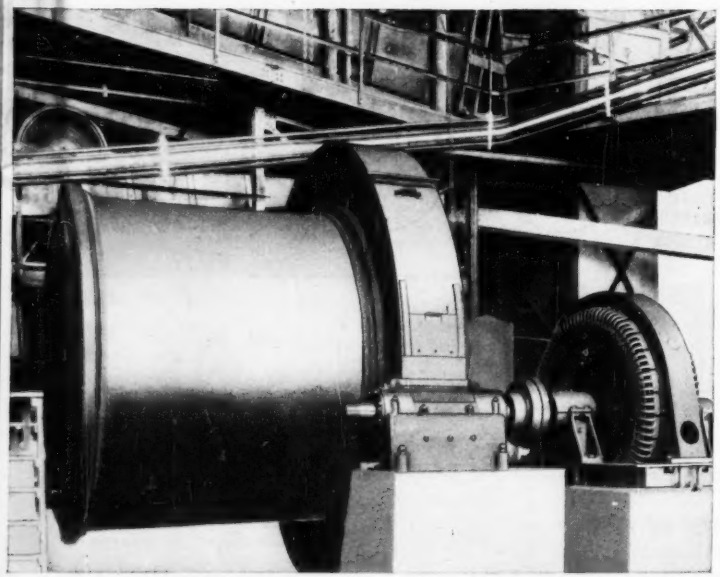
ADDRESS_____

CITY_____ STATE_____

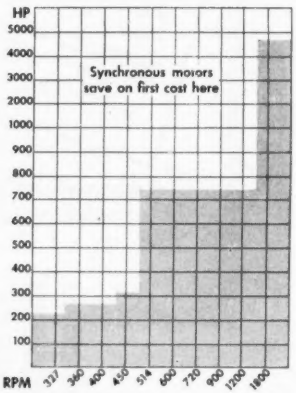


Savings in distribution equipment investment were made possible by selection of this General Electric 2500 hp synchronous motor for a municipal pumping station.

G-E Synchronous Motors

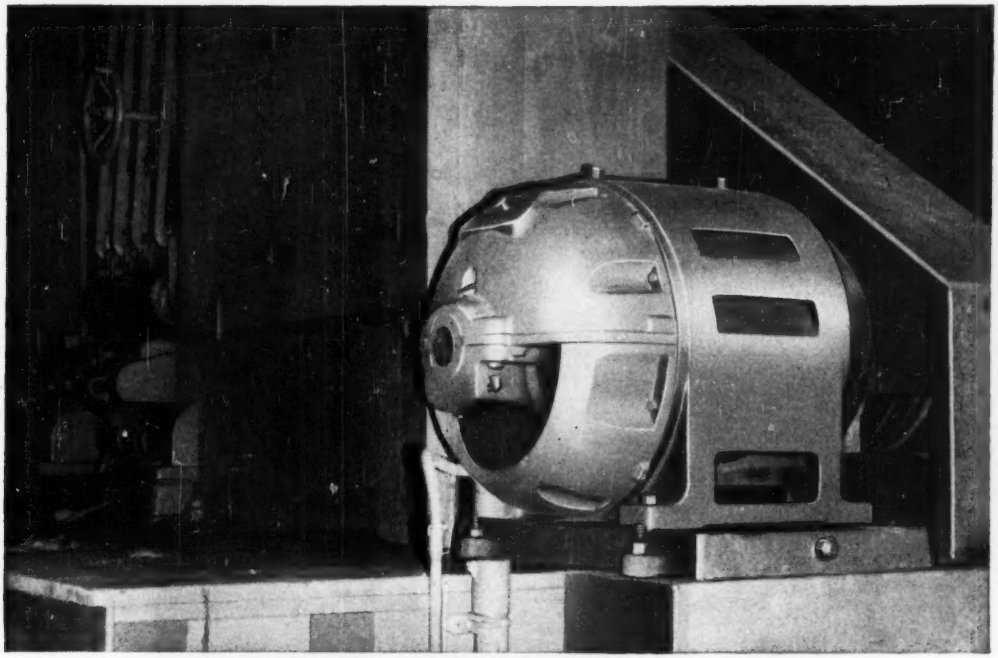


To meet the tough starting requirements of a ball mill, a mining company chose this G-E high-torque synchronous motor rated at 600 hp. Initial cost was low and the motor has given 20 years of dependable service.



Lower first cost of G-E synchronous motors is shown above. For applications in the white area, synchronous motors cost less than any other kind of motor. Calculations below show power savings on a typical 1000 hp, 514 rpm motor.

Gain in efficiency over other types of motors at same rating	**2.2%**
Hourly saving at power rate of $0.01 per/kwh	**$0.184**
Yearly saving (assuming constant operation)	**$1600.00**



Lower operating cost is the rule when General Electric Tri-Clad* synchronous motors are used with equipment such as this horizontal band re-saw, operating almost continuously at heavy loads.

Offer Double Savings

Lower First Costs, Lower Operating Costs Can Be Realized on Large, Constant-Speed Applications in Many Industries

Before you select a drive for a large equipment providing heavy and continuous service, be sure to investigate the economics of General Electric synchronous motors. On many applications such as pumps, compressors, fans, etc., outstanding savings are available.

LOWER FIRST COSTS

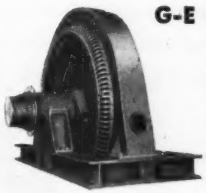
In most ratings where horsepower is equal to or greater than speed, the price tag on a synchronous motor with exciter and control is less than that of any other a-c motor with its control.

And, because a synchronous motor improves plant power factor, initial investment in distribution equipment frequently can be reduced. (The load which any new or expanded power system will carry is proportional to the plant's power factor.)

LOWER OPERATING COSTS

A synchronous motor usually has a higher full-load efficiency than any other type of motor, produces more work per dollar's worth of power consumed. Where loads are heavy and continuous, an advantage of from 0.5 to 3.0% in efficiency pays off.

Engineers with many years of field experience will tailor G-E synchronous motors and control to your job. Call in your General Electric representative—he'll be glad to discuss your particular application. And for more information on G-E synchronous motors, write for bulletins GEA-5332 (low-speed) or GEA-5426 (high-speed) to Section 770-26, *General Electric Company, Schenectady 5, N. Y.*



BE SURE TO SPECIFY G-E SYNCHRONOUS MOTORS

The result of more than 55 years experience in development, manufacture, and successful application, General Electric's line of synchronous motors is available in low speed and high speed types, engine-type and Tri-Clad* construction.

Numerous exclusive design and construction features promote long, dependable service. Get the full details!

Reg. trademark U.S. Pat. Off.

GENERAL ELECTRIC

770-26

Building for the Future . . .

The Chemical Processing Industries are expanding to meet the world demands for new and better products. The Davison Chemical Corporation, an important contributor to this expansion, is also building for the future. As our own business expands, we are able to broaden our service and to create new products for industry and agriculture. Davison facilities, products and technical experience are always available to help you build for the future.

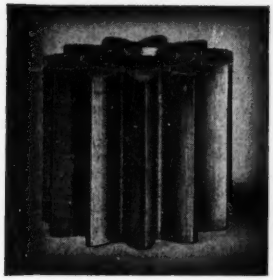
"Progress through Chemistry"

THE DAVISON CHEMICAL CORPORATION

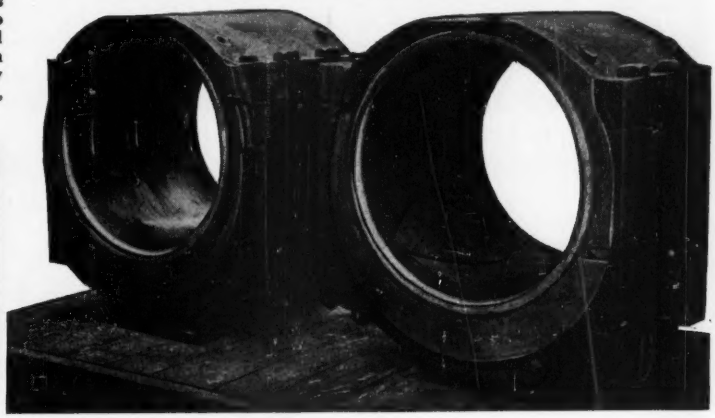
Baltimore 3, Maryland

PRODUCERS OF: CATALYSTS, INORGANIC ACIDS, SUPERPHOSPHATES, PHOSPHATE ROCK, SILICA GELS AND SILICOFLUORIDES. SOLE PRODUCERS OF DAVCO GRANULATED FERTILIZERS

THIS PROPANE-BUTANE PUMP GEAR is cast in Olds 5% nickel bronze to assure excellent wearing qualities, since oil and grease fail to lubricate when in contact with such strong solvents as propane or butane. These pump gears (1¾" to 2½" O.D.) and sleeve bushings, of Olds high leaded nickel bronze, are used by Smith Precision Products Co., South Pasadena, Calif.



ON THESE SURFACES OF OLDS BEARING BRONZE ... a 19" journal, with .045" clearance, turned at 20½ R.P.M. for almost 9 years in a 4-roll calendar mill used in processing cord and rubber fabric for automobile tires.



NICKEL ALLOYED BRONZES

Resist Wear Under Severe Operating Conditions

These large bearings served continuously for nearly nine years at temperatures ranging from 80 to 120° F.

They are made of a high lead nickel-tin bronze, trade-named Olds Bearing Bronze, developed some 15 years ago by the Olds Alloy Company of South Gate, California.

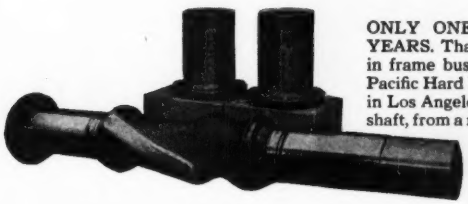
Containing about 18% lead, 5% nickel, 5% tin and 10% zinc (balance copper), this wear-resistant alloy was approved by a leading aircraft manufacturer, early in World War II, for friction bearings operating without galling, under conditions of little or no lubrication.

Although high lead content in bronze alloys improves bearing properties, it lowers strength. However, an adequate nickel content provides age-hardening response which increases both tensile and compressive strength.

Furthermore, nickel tends to diffuse lead in the alloy, refines the grain, and increases resistance to corrosion and erosion.

At the present time, the bulk of the nickel produced is being diverted to defense. Through application to appropriate authorities, nickel is obtainable for the production of nickel alloyed bronzes for many end uses in defense and defense supporting industries.

If interested, we shall be glad to put you in touch with the foundry equipped to quote on your requirements.



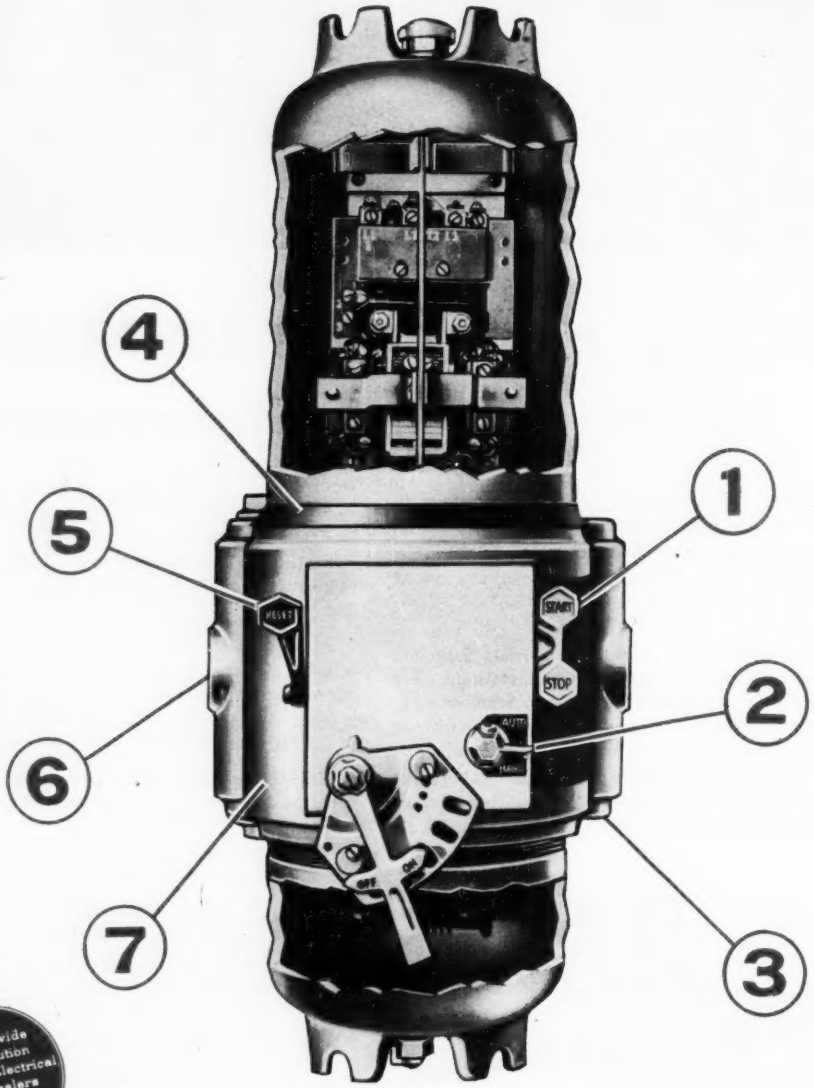
ONLY ONE SET OF REPLACEMENTS IN 13 YEARS. That's how Olds Bearing Bronze economizes in frame bushings and thrust rings on mullers at the Pacific Hard Rubber Division of Stauffer Chemical Co., in Los Angeles. The two bushings shown with the steel shaft, from a muller, are typical of nickel-alloyed bronze parts that minimize galling and heatings despite the abrasive material handled in battery case manufacture.

EMBLEM OF INCO SERVICE

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.

7 important NEW features

... to the many basic advantages of



A Nationwide Distribution Through Electrical Wholesalers

CONDULETS • TRAFFIC SIGNALS

have been added
CROUSE-HINDS Type EPC*
motor starter and circuit breaker CONDULET*

You get all of them on the Model M52

Model M52 EPC is the most flexible explosion-proof line starter and circuit breaker enclosure ever produced. The addition of 7 new features to the proven basic advantages of the EPC construction assures the greatest ease of installation and maintenance.

The exclusive basic advantages of the EPC Condulet have made it the world's leading enclosure for housing motor starters, circuit breakers and combinations for use in hazardous locations.

The basic advantages are:

EASY INSTALLATION . . . The use of a strong light-weight aluminum alloy and the unique three-section design makes it practical for an electrician and his helper to install the largest housing without the use of costly lifting equipment. The internal devices can be easily removed for pulling in the wires.

THREADED JOINT CONSTRUCTION . . . All joints are threaded. All operating shafts and bushings are thread-in-thread construction. This insures maximum safety, easy inspection and maintenance, and maximum corrosion protection.

FLEXIBILITY . . . A large number of different enclosures can be assembled from the wide variety of sizes of bodies and covers. They are not only used for circuit breakers and starters but have proven adaptable for many other types of electrical equipment. The body has numerous conduit hubs for flexibility of installation.

COST AND TIME SAVINGS . . . The outstanding advantages of the unique EPC Condulet over conventional explosion-proof enclosures all add up to lower installed cost and lower maintenance cost.

All of these advantages have been available for years.

Now Crouse-Hinds offers you 7 new improvements to underline the basic advantages of type EPC Condulets and to save you more dollars and more man-hours than ever before.

1. **Built-in Push button stations** available on line starters and combinations of line starters with circuit breakers — START — STOP, FOR — REV — STOP and HIGH — LOW — STOP stations for regular, reversing, or two-speed starters.
2. **Built-in selector switch** is available on line starters and combinations of line starters with circuit breakers. Normally supplied marked HAND — OFF — AUTO or JOG — RUN — OFF, three-position style. Two-position selector switch or combinations of selector switch with START — STOP station can be supplied.
3. **Back conduit entrance** can be supplied by drilling and tapping the boss in the center of the back . . . in addition to the four regular top and bottom hubs.
4. **Protective Neoprene gasket** is available for the upper cover joint. Where EPC Condulets are exposed to unusually severe weather or corrosive conditions, this gasket provides additional protection.
5. **A new RESET lever with threaded shaft,** rotating within a threaded bushing, provides easier and more positive operation of the reset mechanism.
6. **Horizontal through-feed conduit entrances** are provided by drilling and tapping bosses on the sides of the Condulet body.
7. **Greater ease in wiring** is provided by increased height in the center body section and by universal use of open framework mountings for circuit breakers and starters in the new model M52 EPC Condulets.

Model M52
Type EPC Explosion-Proof Condulet in 7, 9, and 11-inch body sizes

Send for YOUR copy of Bulletin 2634 →

*"CONDULET" is a coined word registered in the U. S. Patent Office. It designates a product made only by the Crouse-Hinds Company.

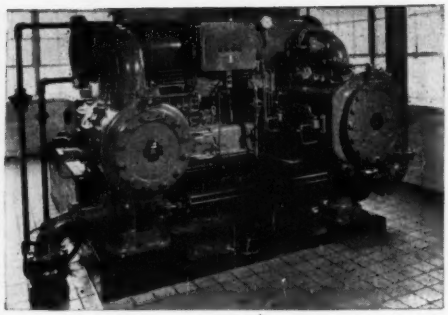
CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

OFFICES: Albuquerque — Birmingham — Boston — Buffalo — Chicago — Cincinnati — Cleveland — Dallas — Denver — Detroit — Houston — Indianapolis — Kansas City — Los Angeles — Milwaukee — Minneapolis — New York — Philadelphia — Pittsburgh — Portland, Ore. — San Francisco — Seattle — St. Louis — Tulsa — Washington. RESIDENT REPRESENTATIVES: Albany — Atlanta — Baltimore — Charlotte — New Orleans — Richmond, Va. Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.

AIRPORT LIGHTING · FLOODLIGHTS

USERS

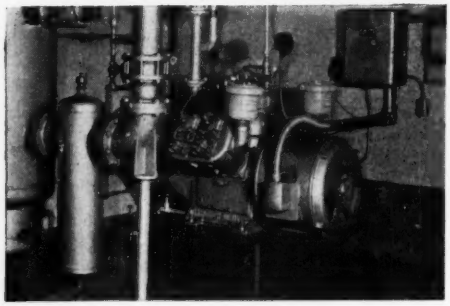
Master mechanic of a Pennsylvania processor tells of five years' experience with their HA. No service trouble whatsoever. In his opinion, the HA is "the best compressor made."



The Gardner-Denver HA Horizontal Two-Stage Air Compressor

TELL

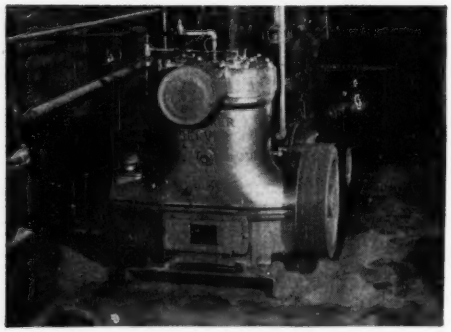
A Kansas City manufacturer has had a WB carrying his full air load almost 24 hours a day for several years. No overhaul required. Has replaced only a few small parts.



The Gardner-Denver WB Vertical Two-Stage Air Compressor

WHY

A manufacturer in Michigan reports he purchased an AA Compressor along with his present building. It's been supplying air for his operations for four years now, and hasn't been touched yet.



The Gardner-Denver AA Vertical Single-Stage Air Compressor

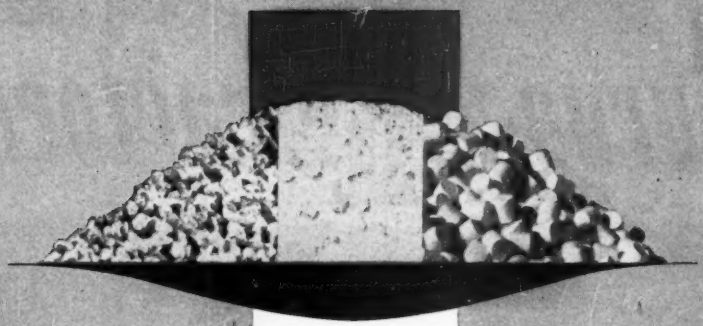
GARDNER-DENVER AIR COMPRESSORS

ARE SO OFTEN SELECTED FOR CONTINUOUS HEAVY-DUTY SERVICE IN MILL OR FACTORY. WRITE FOR DETAILS.

SINCE 1859 **GARDNER-DENVER**

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., Toronto, Ontario

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS



increase efficiency decrease costs with

BAKER PLATINUM METALS CATALYSTS...

It is not too generally known that the platinum metals catalysts are in many instances far more economical in actual use than the base metals and oxides.

The recovery of platinum metals from spent catalyst and conversion to new catalyst is accomplished by Baker at such low cost that in a great number of large scale production processes, the cost of catalysis is calculated in *pennies-per-ton!*

Further, the use of platinum catalyst gives you definite advantages in more rigid processing control, high catalytic activity at low pressures and temperatures, high yield of a contamination-free end product—without costly clean-up procedures!

There is so much to be gained in economy and efficiency that you should investigate Baker Platinum catalysts. They are available from stock as concentrated metals and oxides or dispersed on supports in concentrations from .01% to 10% by weight—on the very type and form of carrier best suited to your individual requirements.

In the platinum metals catalysts, Baker research and production facilities are the largest in the world. We are supplying platinum metals catalysts by the gram for research and by the pound or ton for production.

PLATINUM • PALLADIUM

IRIDIUM • OSMIUM • RHODIUM • RUTHENIUM

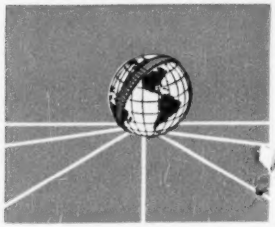
RESEARCH SERVICE:

If catalysis is a part of your production or if you are developing a new process involving a catalytic stage, our research staff is available for consultation (in full confidence of course) upon inquiry, without cost or obligation. Regardless of the extent of your requirements, they will willingly work with you and assist in the determination of the most efficient and economical catalyst for your production. ★

BAKER
& COMPANY, INC.
CATALYSTS

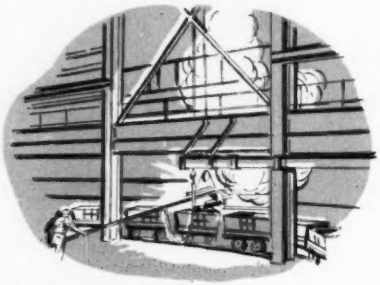
113 ASTOR STREET
NEWARK, N. J.

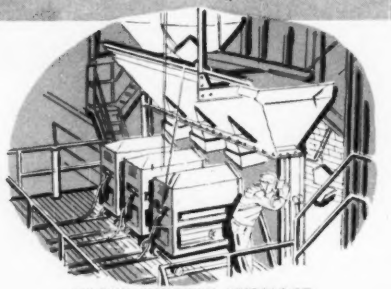
THE HUB OF PLATINUM METALS RESEARCH



Furnace Refractories

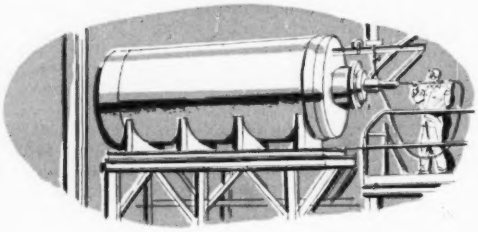
CALCIUM CARBIDE FURNACE

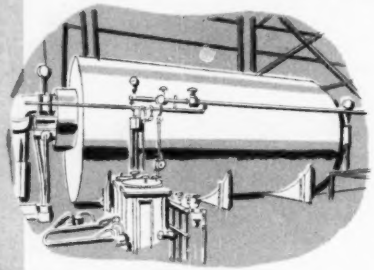




GLASS MELTING FURNACE

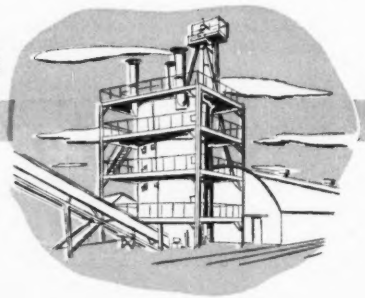
ANHYDROUS HCL FURNACE





SULPHUR BURNER

ROASTER FURNACE



HARBISON-

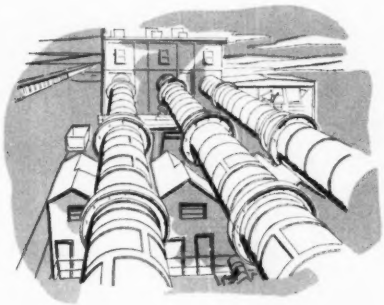
THE WORLD'S
Most Complete
REFACTORIES SERVICE

WALKER

for longer life and continuous performance

Many chemical processing operations are *tough* on refractories. High temperatures, spalling conditions, abrasive action and chemical attack combine their individual destructive factors to impose exceptionally severe treatment on refractory linings in kilns, roasters and other types of furnaces.

To meet the wide variety of conditions that exist in chemical processing applications, Harbison-Walker offers a complete line of refractories from which can be selected the exact types and brands needed for longest life and most economical service in every part of the furnace. Our Technical Service Department will be glad to make specific recommendations for your requirements.



ROTARY KILNS

HARBISON-WALKER REFRACTORIES CO.
AND SUBSIDIARIES

WORLD'S LARGEST PRODUCER OF REFRACTORIES

General Offices . . . Pittsburgh 22, Pennsylvania

You get these

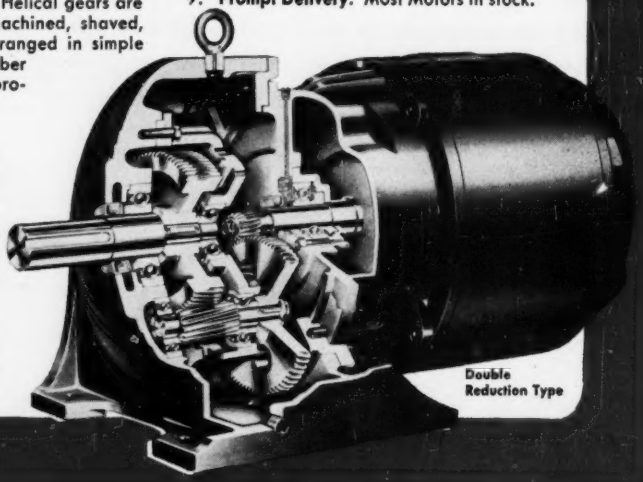
9 POINTS

of *SUPERIORITY* in

PHILADELPHIA GEARMOTOR

1. **Compact.** Designed to conserve greatest space without sacrificing strength or accessibility.
2. **Simplified Assembly.** Motor and gear unit each self-contained and readily separated. In multi-reduction units, gears may be inspected without disconnecting unit from driven machine.
3. **Balanced for Strength.** Gear unit designed to provide high operating stability.
4. **Quiet, Long-life Gears.** Helical gears are alloy steel, precision machined, shaved, wear hardened and arranged in simple train to minimize number of moving parts and promote quiet operation.
5. **Bearings.** Anti-friction bearings used throughout.
6. **Motors.** Reliance Precision-Built A-c or D-c Motors provide dependable power.
7. **Positive Lubrication.** Splash system with large oil reservoir assures constant lubrication and cooling of all parts.
8. **Standardized Construction.** Interchangeable stock parts simplify assembly and maintenance.
9. **Prompt Delivery.** Most Motors in stock.

For fast application of electric drives to individual machines the Philadelphia GearMotoR offers economical, efficient and dependable performance. They are available in single, double and triple reductions with a wide range of speeds: 780 through 7.5 r.p.m. Motor ratings from 1 h.p. through 60 h.p. For full details write on your business letterhead for Catalogue GM-48.



Double Reduction Type

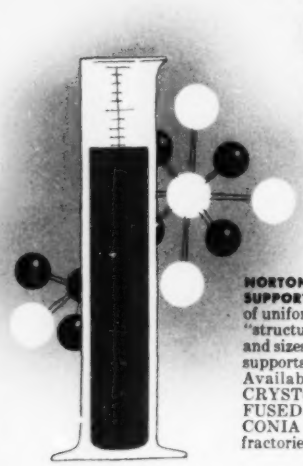
Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

NORTON
Special REFRACTORIES
MAKING BETTER PRODUCTS TO MAKE OTHER PRODUCTS BETTER
. . . For the Chemical Industry



NORTON SPHERICAL CATALYST SUPPORTS give you the benefit of uniform beds, and a choice of "structure-controlled" surfaces and sizes from 3/16" to 1". Other supports are rings and pellets. Available in ALUNDUM, CRYSTOLON, MAGNORITE, FUSED STABILIZED ZIRCONIA and MULLITE refractories.

You Improve Processes, Increase Yields or Cut Costs

When Norton SPECIAL Refractories are ENGINEERED for You

In your business, you keep going ahead *only* when you keep looking ahead. So, research into new ways of turning out more and better products at lower unit costs is always important to you.

Your job of looking ahead will be much easier and more rewarding with Norton Refractory Research working for you. For 40 years, we have helped many chemical processing firms solve high temperature problems complicated by chemical, electrical, and physical variables. We could tell you how we helped them. But, most of our work has been on a confidential basis. No doubt, you'd prefer us to work that way with you.

WHAT ARE YOUR PROBLEMS?

Are you looking for better catalyst supports? Are you interested in refractories that will let you increase your processing temperatures? Are you having trouble with porous mediums for filtration, diffusion or aeration? Are you bothered by short-lived refractories in your electric furnaces? Do you want to lengthen the life of your laboratory ware?

If you answered "yes" to any of those questions, Norton Refractory Research can be a big help to you. Let's see why.

NORTON CATALYST SUPPORTS HAVE CONTROLLED STRUCTURE

To what degree do you want your catalyst to adhere to the surface of your supports?

Thanks to Norton Company's patented method of controlling porosity, you can specify exactly what you need.

Take Norton spherical supports, for example. Suppose you want maximum catalyst adherence to surface. You specify our *medium-porosity* spheres. Their porosity ranges from 30% to 35%, *with open pores on the outside surface* only. On the other hand, let's say you want uniform impregnation of the entire support. Then, you specify our *high-porosity* spheres to get greater deposition of your catalyst. Their porosity ranges from 42% to 47%, *with open pores throughout the spheres.* Low-porosity spheres also available if desired.

Both types of Norton spheres are available in diameters from 3/16" to 1". They provide you with such a uniform bed that channeling and pressure drop are reduced to a minimum.

Other Norton catalyst supports include pellets and rings in diameters from 1/8" to 2".

Materials used in Norton catalyst supports are ALUNDUM*, CRYSTOLON*, MAGNORITE*, FUSED STABILIZED ZIRCONIA, and MULLITE refractories. Each material has its own special properties as a catalyst support. All have the chemical stability and purity that eliminate contamination of both catalyst and end products. High refractoriness and resistance to abrasion contribute to extra long service life.

Norton ALUNDUM Catalyst Supports, in particular, are currently in great demand. They are being used with great success in the manufacture of phthalic anhydride and ammonia and in reforming natural gas. Containing 77% to 89% alumina, they are outstanding for their chemical stability and resistance to abrasion.

Norton ALUNDUM Heat Exchange Pebbles are another product of Norton Research. Because of their high alumina content (95 to 99%), they stand up under alternating oxidizing and reducing atmospheres at high temperatures. Their high resistance to abrasion makes them ideal for heat exchange beds of either static or moving type.

NORTON STABILIZED ZIRCONIA STANDS 4700° F TEMPERATURE

Here's real evidence that Norton Refractory Research can help you look ahead to the higher temperatures that mean greater yields and increased efficiency.

Norton Company was the first to bring fused stabilized zirconia out of the experimental stage early in 1951 . . . and offer it in commercial quantities. Since that time, it has proved itself in many processes.

No other refractory is so chemically stable at such high temperatures under both oxidizing and reducing conditions. In gas synthesis processes, for example, furnaces lined with Norton FUSED STABILIZED ZIRCONIA have stood up for long periods at temperatures approaching 4700° F in a neutral to slightly reducing atmosphere.

Other properties that have won interest in Norton FUSED STABILIZED ZIRCONIA are its low thermal conductivity (6.2 BTU in dense shapes at 2000° F), and its high electrical conductivity at elevated temperatures.

Bulletin No. 1409 gives you the whole story on the properties and applications of Norton FUSED STABILIZED ZIRCONIA.

Other Norton Refractories for furnaces include ALUNDUM, CRYSTOLON and MAGNORITE mixtures in brick, plates, tubes, and blocks. Each is engineered to fit your exact requirements.

Strange to relate, Norton Refractory Research has proved to a number of firms, attracted by the amazing properties of STABILIZED ZIRCONIA, that another engineered Norton special refractory was better for them.

It will pay you, too, to call on Norton Refractory Research to work with you.

NORTON ALUNDUM POROUS MEDIUMS MAKE UNIFORM FLOW CERTAIN

Here, again, Norton Company's patented "controlled structure" process comes to your assistance.

REMEMBER, ALL THE NORTON SPECIAL REFRACTORIES DESCRIBED HERE CAN BE ENGINEERED TO FIT YOUR EXACT REQUIREMENTS—

In porous mediums for filtration, diffusion or aeration, you want to be sure of uniform flow. And you're always sure when you use Norton porous plates, tubes, discs or diaphragms. That's because their pores are uniformly distributed, in the size and open-pore ratio you need.

Norton seamless porous tubes, for example, are now being widely used for filtering water, solvents, cutting oils, wine, food oils and other liquids . . . for reclaiming cleaning fluids . . . in boiler feed water treatment . . . and for handling industrial oil wastes. Their *seamless* construction makes porosity uniform . . . maintains constant air or liquid pressure . . . lets backwashing do a more thorough cleaning job.

Of equal importance to you is the material used in Norton porous mediums. It's Norton ALUNDUM aluminum oxide . . . a tough abrasive and a chemically stable refractory at the same time.

Because of these properties, Norton ALUNDUM porous mediums survive conditions that shorten the life of other products. They are relatively unaffected by the acid or alkaline conditions normally encountered in commercial applications. Their great strength and extreme resistance to abrasion give them extra long life. Their resistance to properly applied temperatures up to 1850° F permits you to burn off organic matter if it clogs the pores.

Custom-made in the sizes and shapes you need, Norton ALUNDUM porous plates, tubes, discs or diaphragms will give you the uniform flow you want at the lowest possible annual cost. *Bulletin No. 140 tells you more.*

NORTON ELECTRIC FURNACE SHAPES GIVE TOP PERFORMANCE LONGER

If electric furnaces are as important to you as they are to us, you'll get more help than you can imagine out of Norton Refractory Research.

They're so important in so many vital phases of our own business that we're always looking for new ways of improving their performance.

We have had great success with Norton ALUNDUM cores, muffles, and tubes. There are four reasons why:

1. Norton ALUNDUM furnace parts are made of fused aluminum oxide that is 99% Al_2O_3.

2. Such purity results in a high degree of stability and chemical inertness. This prevents reactions with resistor materials as well as crucibles and boats of platinum, nickel or fused oxide.

3. Norton ALUNDUM furnace shapes are excellent thermal conductors. This means small temperature gradient between the resistor and furnace interior.

4. Norton ALUNDUM refractory is a good electrical insulator up to relatively high temperatures. One test on an ALUNDUM tube shows a direct current resistance of 7.5×10^7 ohms/cm³ at 600° C. This value did not fall off materially until a temperature in excess of 1600° C was reached.

Where high thermal conductivity and resistance to heat shock are more important, Norton CRYSTOLON shapes offer advantages over ALUNDUM shapes. They are limited, however, to resistors of nickel chromium alloys and to temperatures not exceeding 2100°F.

Norton FUSED STABILIZED ZIRCONIA shows great possibilities as induction heating elements in ultra high frequency induction furnaces and as resistors in high temperature resistance furnaces.

Bulletin No. 458, titled "The Construction of Electric Furnaces for the Laboratory" is yours for the asking.

NORTON ALUNDUM LABORATORY WARE OFFERS YOU MANY ADVANTAGES

No other laboratory ware combines so many of the properties you want for your laboratory development, experimental or analytical work.

1. It's chemically stable. Made of fused alumina containing 85% Al_2O_3 (99% in special mixtures), it is not attacked by any organic solvent. Only hydrofluoric acid, concentrated phosphoric acid and strong, hot caustic solutions affect it.

2. It stands temperatures up to 1900° C. So, you can melt pure metals in thick-walled Norton ALUNDUM crucibles. You can also ignite extracted residues in Norton ALUNDUM thimbles.

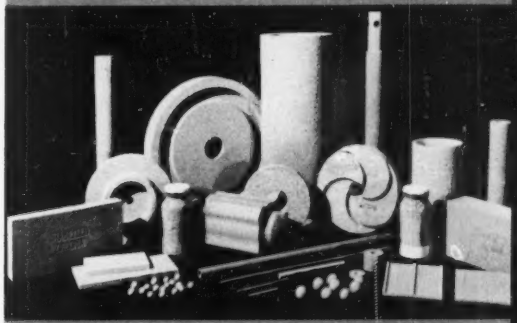
3. It's easy to clean. You just dip it briefly in a fairly strong acid solution (not phosphoric, hydrofluoric or concentrated sulphuric); wash with water, and ignite to constant weight.

4. For filtering, it comes in four degrees of permeability to retain 0.1, 5.0, 20.0 and 30 microns particle sizes.

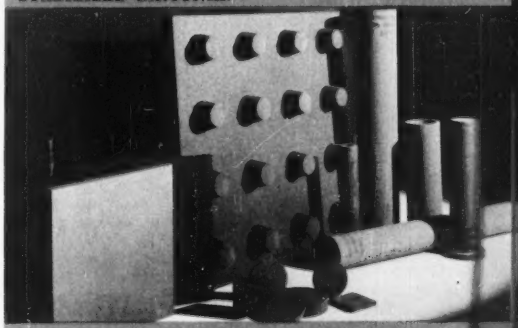
Bulletin No. 793 tells you all about Norton ALUNDUM Laboratory Ware. Get it from your regular source of laboratory ware, or write us direct.

LET'S TALK IT OVER.

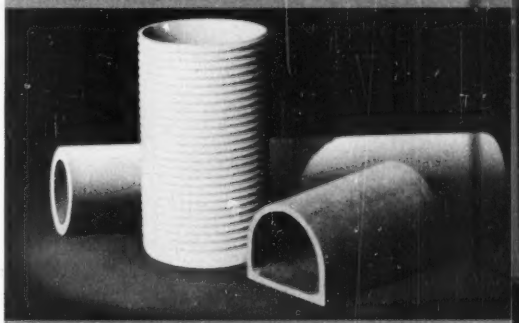
*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries



NORTON REFRACTORY SHAPES FOR REACTION FURNACES come in bricks, plates, tubes and blocks in ALUNDUM, CRYSTOLON, MAGNORITE and FUSED STABILIZED ZIRCONIA.

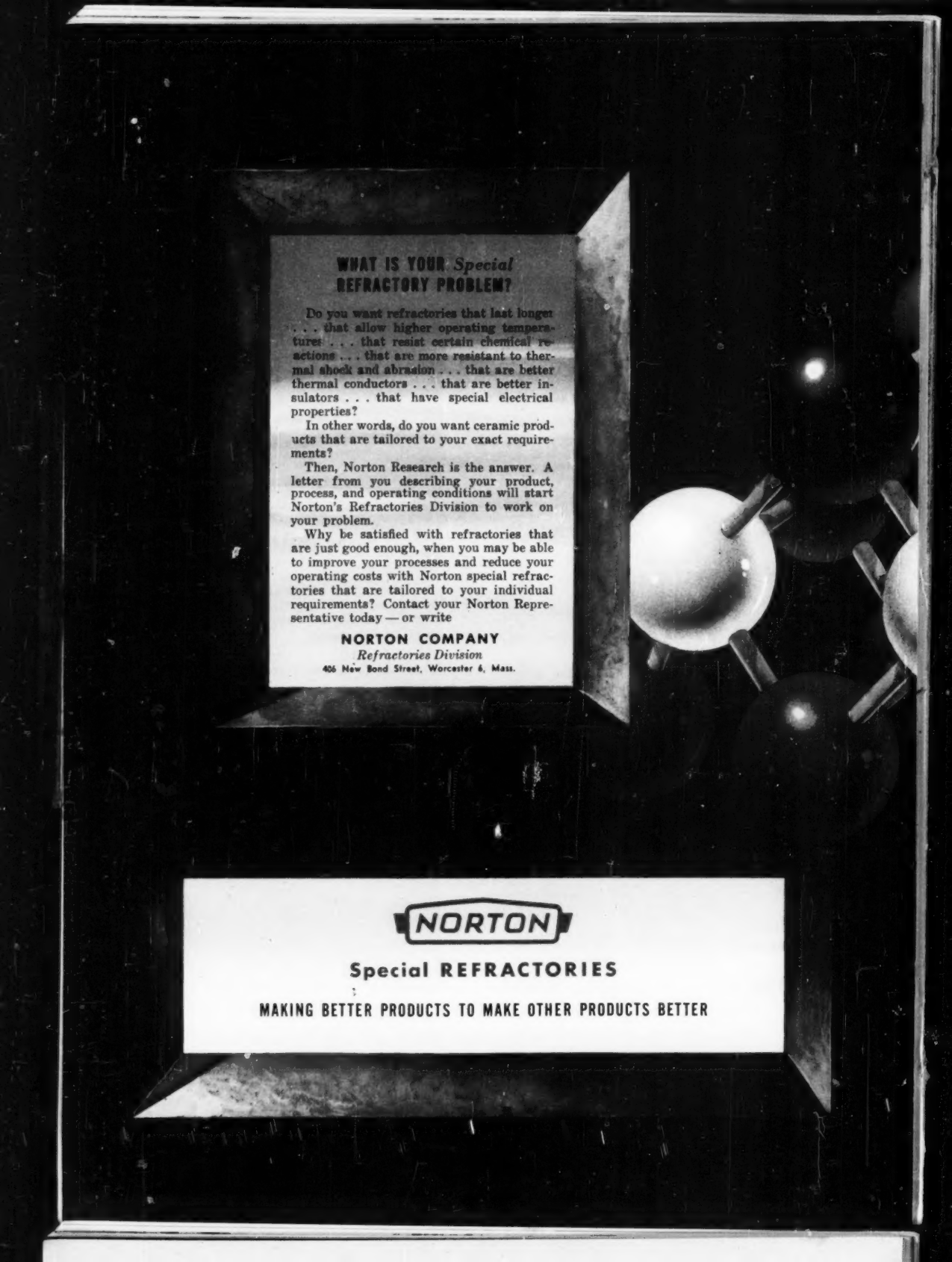


NORTON ALUNDUM POROUS MEDIUMS come in plates, tubes, discs and diaphragms engineered to fit your exact filtering, diffusing or aerating requirements.



NORTON ELECTRIC FURNACE REFRACTORIES come in cores, tubes, and muffles made of ALUNDUM and CRYSTOLON refractories.

NORTON ALUNDUM LABORATORY WARE, famous for its chemical stability, high refractoriness and uniform porosity, comes in crucibles, ignition capsules, incinerating dishes, cones, dishes, discs, thimbles and boats in all sizes and shapes.



WHAT IS YOUR *Special* REFRACTORY PROBLEM?

Do you want refractories that last longer . . . that allow higher operating temperatures . . . that resist certain chemical reactions . . . that are more resistant to thermal shock and abrasion . . . that are better thermal conductors . . . that are better insulators . . . that have special electrical properties?

In other words, do you want ceramic products that are tailored to your exact requirements?

Then, Norton Research is the answer. A letter from you describing your product, process, and operating conditions will start Norton's Refractories Division to work on your problem.

Why be satisfied with refractories that are just good enough, when you may be able to improve your processes and reduce your operating costs with Norton special refractories that are tailored to your individual requirements? Contact your Norton Representative today — or write

NORTON COMPANY
Refractories Division
406 New Bond Street, Worcester 6, Mass.

NORTON

Special REFRACTORIES

MAKING BETTER PRODUCTS TO MAKE OTHER PRODUCTS BETTER

Aid or Trade?
A CRISIS AHEAD

A crisis in the foreign trade relations of the United States is in the offing. It is a crisis caused by:

1. Efforts of producers in friendly nations to earn more dollars by increasing exports to the United States, and
2. Efforts of industries in the United States which would be hurt by competition from these imports to keep them out.

This crisis is a threat to the effectiveness of American leadership in the crucial effort to build the nations of the free world into a strong and unified group. It is the purpose of this editorial to advocate a constructive approach to the difficult situation that is developing.

Background of the Crisis

Most countries in the free world—with American aid—have managed to push their outputs well above prewar levels. As they have done so, they have been urged by our highest government officials to increase their exports to us. Sales in our market enable these countries to earn dollars which they use in turn to buy the products of America's farms and factories. Thus, as they become self-supporting, the need of American aid is reduced.

But as these efforts to export more to the United States have promised increasing success, competitive American producers have become increasingly alarmed about what that success might do to them. Consequently, they are seeking more protection—by appeals to the U. S. Tariff Commission to recommend higher import duties and by appeals to Congress for new laws to discourage imports.

Our Friends Protest

A year ago Congress answered one of these appeals by imposing a quota on imports of dairy products. Now, among many other legislative proposals being strenuously pressed is a move to extend the scope of "Buy American" legislation. A year ago the U. S. Tariff Commission had only four petitions for increased import duties on its docket. Since then fourteen more petitions have been filed and others are definitely on the way.

Faced by these mounting efforts to block the sale of their products in the American market, no less than eleven friendly nations, including Great Britain, France, Italy, Canada, the Netherlands, Switzerland and Denmark, have filed protests with our State Department. Through many of the protests runs one refrain. Although stated in diplomatic language, it might be correctly paraphrased to say: *"In*

sending us aid you have made it very clear that you want us to get on a self-supporting basis at the earliest possible moment. But, when we begin to make headway in that direction by trying to sell you more of the things we are equipped to produce, you start closing your market to us." The threat of European resentment against the United States being stirred up by this argument is obviously great.

At the same time there exist grounds for special resentment in the United States against certain prospective imports of European manufactured goods – those of machine tools, for example. In part these will be produced with machinery that has been sent to Europe as part of our economic aid program. With absolutely no diplomatic language involved, the argument, which will be extended much farther than the facts would justify, will run: "*We gave those people the equipment that they now use to cut our throats!*" This line of argument will find response among workers as well as employers in industries faced by more competition from imports. Labor, too, is keen for protection against more foreign competition.

Aid or Trade?

As between continuing direct economic aid to Europe or accepting the imports that would make those countries self-supporting, some would prefer to continue the aid program. They argue that the tax machinery of the federal government can spread the burden of aid broadly, while we have no comparable machinery that can cushion the shock to individual industries, firms and communities that may result from stepped-up imports of competitive products.

As we see it, this position is untenable. It would make rubbish of our Atlantic Charter promise ". . . to further the enjoyment by all States, great or small, victor or vanquished, of access, on equal terms, to the trade and to the raw materials of the world which are needed for their economic prosperity." It would be an admission that, for all our profession of faith in competition and our opposition to European cartels, we really don't believe in competition.

U. S. Self-Interest

The people of this country have invested billions of dollars and seven years of hard work in the attempt to put our allies on a self-supporting basis. If we keep their goods out by raising trade barriers, we are directly defeating our own purposes.

Also, in moving to protect some groups of American producers we should be hurting others. For many American producers the export market, which this year will take about $14 billion of civilian goods, spells the difference between operating at capacity and closing down 25% of their facilities. When we discourage imports we cut off dollar earnings by other nations which are spent here to keep some of our factories and farms going.

At the same time, it must be recognized that certain American industries and their capacity to maintain employment will be hurt by increased imports. Hence it becomes critically important for the United States to formulate a national program designed to help these industries and communities take up the shock.

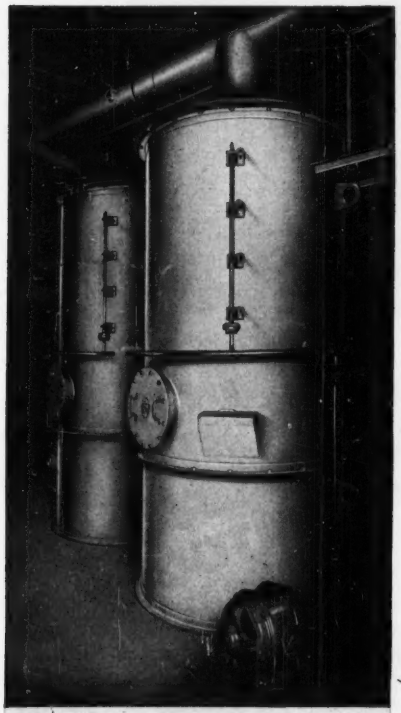
There is no neat and simple prescription by which this can be done, but several possibilities have been suggested. One on which there is general agreement is that tariff reductions should be gradual. To cushion their impact, the government might well give preference on defense orders to industries and areas adversely affected by an increased volume of imports. Direct assistance to workers and companies in shifting to different lines of business may be worth consideration.

These are by no means all the possibilities. They may not even be the best. But they do serve to suggest the necessity for flexibility and imagination in dealing with the growing crisis in trade relations. *Our ingenuity in developing new ideas to meet this crisis may well be a decisive factor in our effort to weld the free nations into a strong and durable alliance.*

McGraw-Hill Publishing Company, Inc.

DUST and FUME Control

Special equipment engineered to solve individual problems posed by dusts of all kinds, fly ash, chemical fumes, gases of any temperature, aerosols, and other troublesome air polluents



MAHON FOG-FILTERS AT WORK

The installation illustrated above was specially designed for the Motor State Oil & Grease Co., Jackson, Mich. PROBLEM: To eliminate H_2S odor from sulphonated grease manufacturing operations. The problem was complicated by grease and oil fumes present in H_2S gas. SOLUTION: A two-tower Fog-Filter connected in series was designed with high pressure water fog collecting practically all of the grease and oil fumes in the first tower. A caustic solution employed in the second tower and fogged at lower pressure removes the remaining H_2S from the air before it is exhausted into the atmosphere.

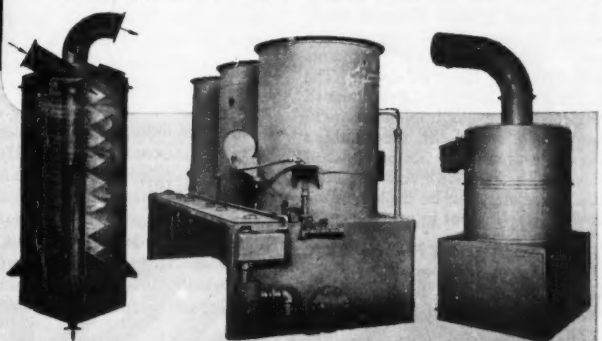
In dealing with air contaminants, each individual air cleaning problem must be approached with a view to determining what type of collector or filter is required to produce maximum results under existing conditions. Study and analysis of the character and extent of the polluent is therefore imperative in arriving at a satisfactory solution. Mahon dust and fume control engineers have, over a period of years, developed and perfected special Wet and Dry Collectors and Fog-Filters which have proved highly successful in coping with all types of industrial air contaminants—a few are illustrated here . . . they are serving today in some of the most difficult and mandatory air cleaning jobs in industry. Each installation has been engineered to do the specific job. If you have an air pollution problem, regardless of its character, it will pay you to call in a Mahon engineer and let him show you what Mahon equipment has done with like polluents under conditions comparable to your own. See Mahon's Insert in Sweet's Mechanical Industries File for further information, or write for Industrial Equipment Catalog A-652.

THE R. C. MAHON COMPANY

Main Plant and Home Office, Detroit 34, Michigan

Engineers and Manufacturers of Dust and Fume Control Equipment Including Cyclone Collectors, Hydro-Foam Collectors, Jet Trap Collectors, Hydro-Filter Collectors, and Fog-Filters and Cupola Stack Washers.

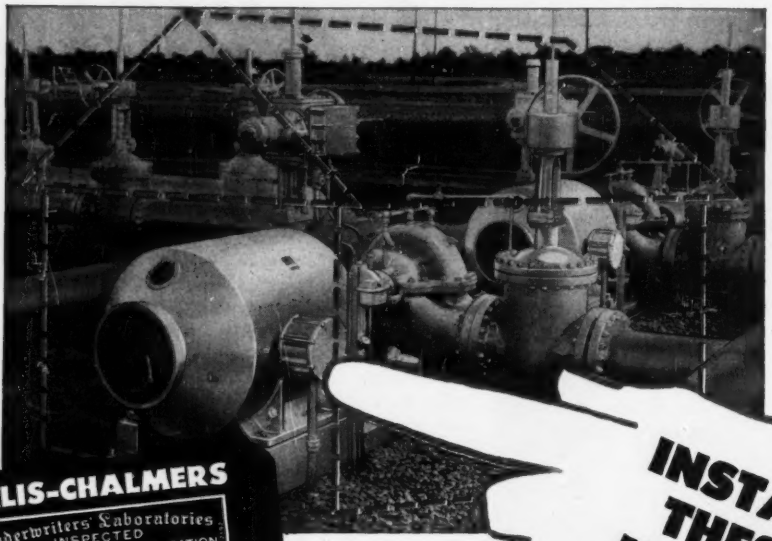
All Mahon Equipment is Erected by Mahon to Insure Complete Satisfaction.



Fog-Filter | Hydro-Foam Dust Collector | Jet Trap Dust Collector

MAHON

No building to buy!



INSTALL THESE MOTORS OUTDOORS

ALLIS-CHALMERS
Underwriters' Laboratories INSPECTED
MOTOR FOR HAZARDOUS LOCATION
ELEC 1012 CLASS 1 GROUP D NO. L
Tube-Type Motors

YOU CAN ELIMINATE costly building on many different kinds of installations by using Allis-Chalmers tube-type, totally-enclosed, fan-cooled motors and installing them outdoors. The motors shown here operate outdoors all year round in a tough midwestern climate. Rain, snow, dirt, the weather's worst conditions, do not affect their dependable operation. And the same kind of savings can be made in hundreds of applications in many fields.

Self-Cleaning Feature Saves Maintenance

The cooling system in this unique motor is practically self-cleaning. Cooling air is blown through straight, smooth tubes at sufficient velocity to clean out ordinary dirt. There are no corners or pockets to trap dirt or moisture. If sticky dirt clings, a ramrod will clean the tubes in seconds.

In either indoor or outdoor service, Allis-Chalmers tube-type, totally-enclosed, fan-cooled motors reduce maintenance by keeping themselves clean. *Also available in explosion-proof design.* Get full details from your A-C Authorized Distributor or District Office. Or write Allis-Chalmers, Milwaukee 1, Wis., asking for bulletin 51B7149.

A-3699

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

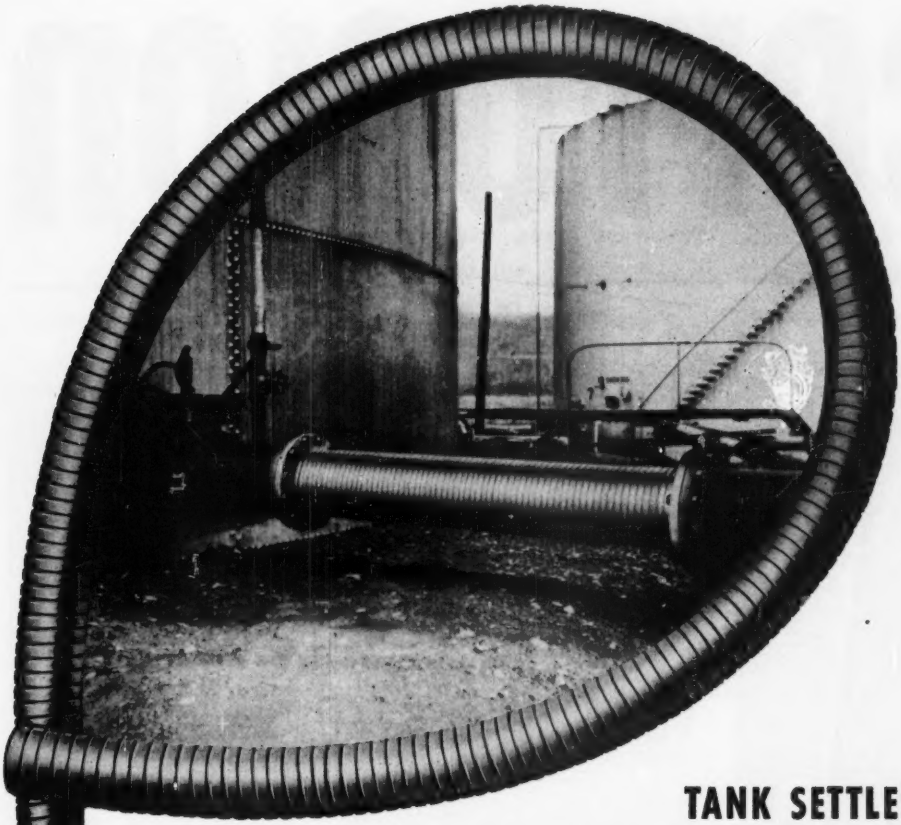
CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

Texrope and Vari-Pitch are Allis-Chalmers trademarks.

ALLIS-CHALMERS



TANK SETTLES . . .

PIPE WALKS . . . BREAK AVOIDED WITH PENFLEX

Tank settlement . . . thermal expansion and contraction caused misalignment of pipe and the consequent breakage of rigid pipe connections on large oil storage tanks. Oil and gasoline was lost . . . a fire hazard was ever present. The answer was offered by Penflex engineers.

Today, this large New England storage center has no trouble with pipe breakage. A length of 12" I.D., four-wall interlocked specially packed Penflex tubing was installed with tight-packed flanges. No amount of settling of the tank or thermal expansion causes breakage of connections. The easy flexing Penflex "walks" with the tank . . . yet maintains a tight leak-proof connection at all times. Leakage has been eliminated . . . fire hazard reduced.

Let Penflex engineers help you on flexible tubing application problems. Penflex manufacturers a complete line of four wall, interlocking and seamless welded corrugated flexible tubing . . . metallic hose, tubing or couplings from ⅛" I.D. and up . . . automatic barrel fillers, pneumatic rivet passers, accessories and fittings. Write for folder "Flexineering," a valuable production aid.

Pennsylvania Flexible Metallic Tubing Company, Inc., 7234 Powers Lane, Phila. 42, Pa.
Branch Sales Offices: **Boston • New York • Chicago • Houston • Cleveland • Los Angeles**

penflex

HEART OF INDUSTRY'S LIFE LINES

CORROSION

CHEMICAL RESISTANCE OF "KARBATE" PRODUCTS

This table shows the grade of "Karbate" Impervious Graphite and the type of "National" Resin Base Cement recommended for commercial use in the more common corrosive chemicals. The concentrations and temperatures listed are based on field and laboratory experience, but *the satisfactory use of these materials is not limited to the chemical reagents or conditions shown in this table.*

Chemical Reagent	Concentration	Fluid Temperatures up to	Recommendation: Grade	Recommendation: Cement
ACIDS				
Acetic acid	All	Boiling	22	14
Acetic anhydride	100%	Boiling	22	14
Arsenic acid	All	Boiling	22	14
Boric acid	All	Boiling	22	14
Carbonic acid	All	200° F	22	14
Chromium trioxide, aq. soln.	0-10%	Boiling	22	14
Citric acid	All	Boiling	22	14
Formic acid	All	Boiling	22	14
Hydrobromic acid	All	Boiling	22	14
Hydrochloric acid	0-48%	185° F	22	
Hydrofluoric acid	48-60%	—	x	14
Hydrofluoric acid	Over 60%	Boiling	22	14
Hydrofluoric acid	All	Boiling	22	14
Hydrogen sulphide water	All	212° F	22	(t)
Lactic acid	100%	185° F	22	(t)
Monochloracetic acid	0-10%	140° F	x	
Nitric acid	10-20%	—	22	14
Nitric acid	Over 20%	Boiling	22	14
Nitric acid	100%	Boiling	22	14
Oleic acid	All	Boiling	21	14
Oxalic acid	0-85%	Boiling	22	(t)
Phosphoric acid	100%	Boiling	22	
Stearic acid	0-75%	338° F	x	14
Sulfuric acid	75-96%	—	22	14
Sulfuric acid	Over 96%	Room	22	
Sulfuric acid	All	Boiling		
Sulfurous acid	All			
Tartaric acid			22	15
ALKALIES			22	15
Ammonium hydroxide	All	Boiling	21	15
Monethanolamine	All	Boiling	21	15
Sodium hydroxide	0-67%	275° F	21	
Sodium hydroxide	67-80%	Boiling		
Tetramine C	All		22	14
SALT SOLUTIONS			22	14
Aluminum Chloride	All	Boiling	x	
Ammonium thiocyanate	0-63%	Boiling	22	14
Arsenic trichloride	100%	230° F	22	14
Calcium chlorate	0-10%	140° F	22	14
Calcium hypochlorite	All	90 °F	22	14
Cupric chloride	All	Boiling	22	14
Ferric chloride	All	Boiling	22	14
Ferrous chloride	All	Boiling	22	14
Ferrous sulphate	All	Boiling	22	14
Manganous sulphate	All	Boiling	22	14
Nickel chloride	All	Boiling	22	14
Nickel sulphate	100%	Boiling	22	14
Phosphorus trichloride	All	Room	21	
Sodium chloride	0- 4%	Boiling	22	14
Sodium chlorite	0-25%	Boiling	22	14
Sodium hypochlorite	All	Boiling	22	14
Stannic chloride	All	Boiling	22	
Zinc ammonium chloride	All			
Zinc chloride	All			14
Zinc sulfate			22	
HALOGENS, AIR, WATER		338° F	x	14
Air	—	Room	22	14
Bromine	100%	Room	22	14
Bromine water	All	Room	x	
Chlorine—dry	100%		x	
Chlorine water	All			
Iodine	100%			
Fluorine				

Chemical Reagent	Concentration	Fluid Temperatures up to	Recommendation: Grade	Recommendation: Cement
HALOGENS, AIR, WATER cont.				
Steam	—	338° F	22	14
Water	—	Boiling	22	14
ORGANIC COMPOUNDS				
Acetone	0-100%	Boiling	22	14
Amyl alcohol	100%	Boiling	22	14
Aniline	100%	338° F	22	14
Aniline hydrochloride	0-60%	Boiling	22	14
Benzene	100%	212° F	22	14
Benzene hexachloride	100%	Boiling	22	14
Butyl alcohol	0-100%	Boiling	22	14
Butyl "Cellosolve"*	100%	Boiling	21	14
Carbon tetrachloride	0-100%	257° F	22	14
"Cellosolve"*	100%	Boiling	22	14
Chlorethylbenzene	100%	140° F	22	14
Chloroform	—	338° F	22	14
Deoxidine	100%	Boiling	22	14
Dowtherm	0-100%	Boiling	22	14
Dioxan	0-100%	122° F	22	14
Ethyl alcohol	0-8%	200° F	22	14
Ethylene chlorohydrin	100%	Boiling	22	14
Ethylene dibromide	100%	Boiling	22	14
Ethylene dichloride	Saturated	Room	22	14
Ethyl mercaptan—water	100%	Boiling	22	14
Freon 11 and 12	100%	338° F	22	14
Gasoline	0-100%	Boiling	22	14
Glycerine	100%	Boiling	22	14
Isopropyl acetate	0-100%	Boiling	22	14
Isopropyl alcohol	100%	Boiling	22	14
Isopropyl ether	100%	Boiling	22	14
Kerosene	All	Boiling	22	14
Mannitol	100%	Boiling	22	14
Methyl isobutyl ketone	0-100%	Boiling	22	14
Methyl alcohol	100%	Boiling	22	15
Monochlor benzene	100%	Boiling	22	14
Octyl alcohol	100%	Boiling	22	14
Paradichlorbenzene	100%	Boiling	22	14
Paraldehyde	100%	Boiling	22	14
Tetrachlorethene, sym.	100%			
Trichlorethylene				
MIXTURES		Room	22	14
Ammonium persulfate plus sulfuric acid	25%	140° F	22	14
Calcium chloride plus calcium chlorate	20%		22	15
Chloronated ethyl alcohols	30%	Boiling	x	
Chrome plating solns.	10%		22	14
Hydrochloric acid sat. with chlorine	All	Boiling	22	14
Nickel plating solns. (chloride)	All		22	14
Nickel plating solns. (sulfate)	Over 20%	Boiling	22	(t)
Nitric acid plus hydrofluoric acid	All	140° F		
Oakite acid materials—O.C. 32, O.C. 33, O.C. 36, O.C. 84A, O.C. 84M, CRYS. 87, O.C. 88	15%	Boiling	22	14
Parkerizing solution	5%	Boiling	22	14
Rayon Spin bath	All	Boiling	22	14
Sodium hypochlorite plus sodium hydroxide	All	Boiling	21	—
Sulfuric acid plus nitric acid	All	Boiling	x	
	0.25%			
	96% .03%			

(x) Not recommended

NOTE: (t) "National" No. 14 Cement used with threaded joints will give serviceable life.
(*) The term "Cellosolve" is a registered trade-mark of Union Carbide and Carbon Corporation.

The terms "National" and "Karbate" are registered trade-marks of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY • **A Division of Union Carbide and Carbon Corporation**
30 East 42nd Street, New York 17, N. Y.

District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco
IN CANADA: National Carbon Limited, Montreal, Toronto, Winnipeg

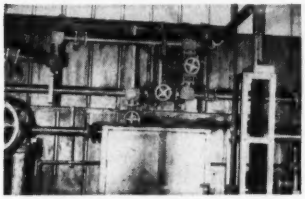
...AND THE CONSERVATION OF CRITICAL MATERIALS

INSTALL NATIONAL carbon and graphite and "Karbate" impervious graphite equipment for processing, conveying and storage of corrosive fluids.

IMMUNE TO THERMAL SHOCK • LIGHT WEIGHT • NO METALLIC CONTAMINATION • LONG LIFE—LOW MAINTENANCE

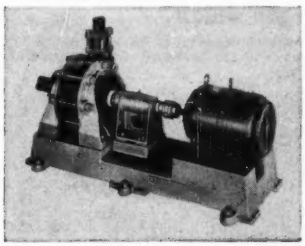
HEAT EXCHANGERS

Wide variety of standard and custom built models in time-proven designs. Shell and tube, cascade, concentric and immersion types available in stock sizes. High rates of heat transfer. Catalog Sections S-6620, S-6690, S-6715, S-6716, S-6750, S-6780.



PIPE, FITTINGS AND VALVES

Complete standard line to handle your toughest fluid conveying requirements. Easy to install and maintain with simple hand tools. Catalog Section S-7000.

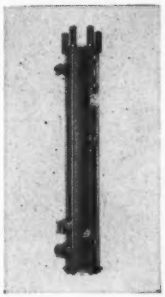


PUMPS

The centrifugal pump for handling corrosive fluids—rugged design, simple construction, trouble-free rotary seal. Handling capacities to 800 G. P. M. Catalog Section S-7200.

TOWERS

"Karbate" impervious graphite towers for absorption, fractionation, extrusion, scrubbing and many other processing operations. Easily erected from standardized monolythic sections and components. Catalog Section S-7350.



BRICK

Accepted material for lining tanks, towers, digesters and other vessels containing corrosive chemicals. Catalog Section S-6210.

HCL COMBUSTION CHAMBERS

Versatile, standardized line for hydrogen chloride synthesis. Burns moist gas. Simplicity of operation. Catalog Section S-7530.

STEAM JETS

Withstand severe corrosive conditions and thermal shock in heating and agitating corrosive solutions by direct injection of steam. Catalog Section S-7300.

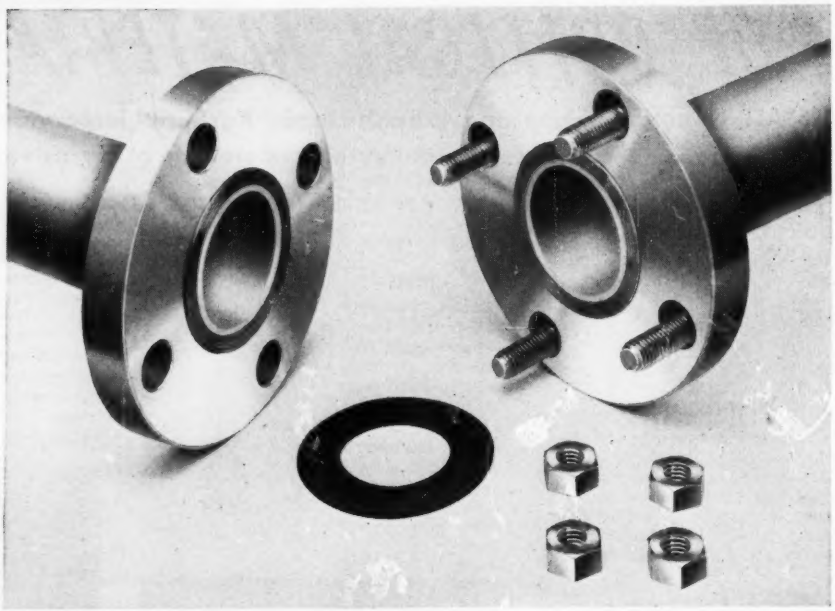
GROUND ANODES

"National" Graphite Ground Anodes for cathodic protection of buried, submerged or exposed metallic structures provide for control of current input to meet specific environmental conditions. Catalog Section S-6510.

HCL ABSORBERS

Standard and custom built models to meet *any* hydrochloric acid production requirement. Falling-film principal of absorption — proven efficient and compact design. More HCL produced in "Karbate" absorbers than in all other types combined. Catalog Section S-7430.

Speedline Corrosion-Resistant FITTINGS



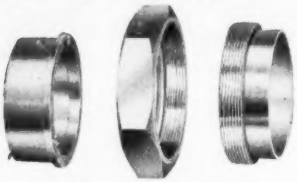
help reduce your piping costs and simplify pipeline assembly

Here's the double advantage *Speedline* Fittings give you. First, you can use light-walled Schedule 5 corrosion-resistant pipe. That gives you a far less costly installation and it conserves critical alloys. Second, because of their special design, *Speedline* Fittings are easier to use than other types of fittings. So you get real advantages in savings of assembly time.

The new *Speedline* Fittings catalog shows you how to improve your piping jobs at less cost than you have paid in the past. A note on your company letterhead will bring you a copy. Write today.

Speedline insert flange

Corrosion-resistant serrated insert in a carbon steel flange. Only tools needed for assembly are a standard expander and open-end wrench.



Speedline tube union

Combines best features of screwed pipe and sanitary unions; eliminates leakage encountered with ground joint type fittings.

Speedline aligning connector

Joins pipe schedules 5, 10 and 40. Also made for use with tubing.

Speedline Corrosion-Resistant FITTINGS

—the newest thing in pipeline economy

HORACE T. POTTS CO. *Since 1815* Erie Avenue & D Street • Philadelphia 34, Pa.

Can Processors Get Stainless Steel Piping Now?

YES **THEY CAN,** in spite of shortages and slow deliveries on many stainless materials.

For verification, see the picture at the right—a carload of *ESCO* stainless piping recently shipped to a well known manufacturer. Piping is made up entirely of *ESCO*'s cast stainless fittings and Spuncast pipe.

This centrifugally cast pipe is produced in a wide variety of standard and special analyses, and in schedule 40 wall or heavier. It is superior in resistance to corrosion, in withstanding wear or abrasion, and in mechanical strength. And under present regulations . . .

You still can get it.

Also available are stainless castings, valves, pipe fittings, flanges, etc.

Full information on *ESCO* Spuncast pipe is contained in our new catalog "Stainless and High Alloy Products". If you don't already have a copy, we suggest you get one from your nearest *ESCO* representative; or send us the filled-in coupon.

ESCO STAINLESS AND HIGH ALLOY STEELS

ELECTRIC STEEL FOUNDRY

2143 N. W. 25th Avenue, Portland 10, Oregon

Sales Offices and Warehouses

CHICAGO, ILLINOIS	NEW YORK CITY, NEW YORK
HONOLULU, T. H.	SAN FRANCISCO, CALIFORNIA
HOUSTON, TEXAS	SEATTLE, WASHINGTON
LOS ANGELES, CALIFORNIA	SPOKANE, WASHINGTON
EUGENE, OREGON	MEDFORD, OREGON

IN CANADA —*ESCO* LIMITED, VANCOUVER, B. C.

ELECTRIC STEEL FOUNDRY
2143 N. W. 25th Avenue, Portland 10, Oregon

Please send me a copy of catalog "Stainless and High Alloy Products".

Name_____

Company_____

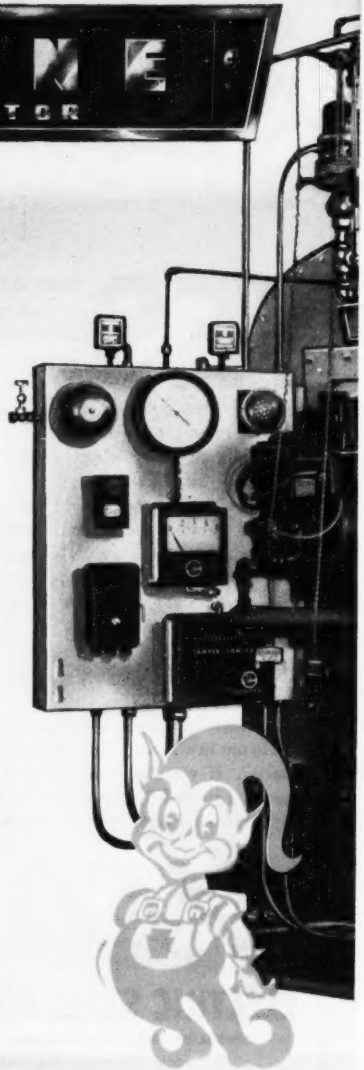
Address_____ Zone_____

City_____ State_____

MOVE IN STEAM

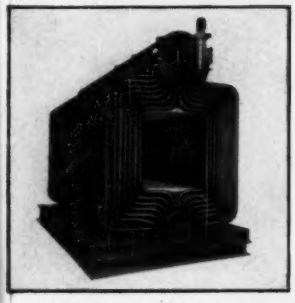
NO BRICKWORK — NO EXCAVATION — NO FOUNDATION

ERIE CITY
KEYSTONE
STEAM GENERATOR



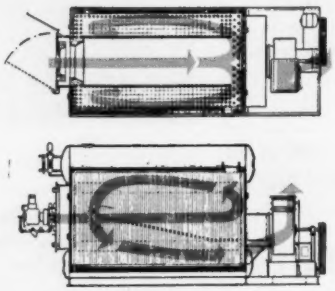
JUST HOOK'ER UP TO SERVICES

It's a compact, 2 drum *water tube* boiler heavily insulated and steel cased, complete with automatic oil or gas or combination burner. It has integral water cooled furnace. Keystones are available in standard capacities from 2490 lb. steam per hour and up as factory assembled units in a wide range of operating pressures. At the left is shown the bare boiler element to illustrate that Keystones are not ordinary packaged boilers. They are rated 5 square feet of heating surface per developed horsepower like largest water tube boilers.



UNIQUE 3 PASS GAS TRAVEL

Gas flow areas are proportioned to decreasing gas temperatures providing practically constant velocity and assure no pockets where unburned gases can accumulate. All boiler surfaces exposed to heat transfer are completely submerged below water line. Booklet SB38 tells the complete story.

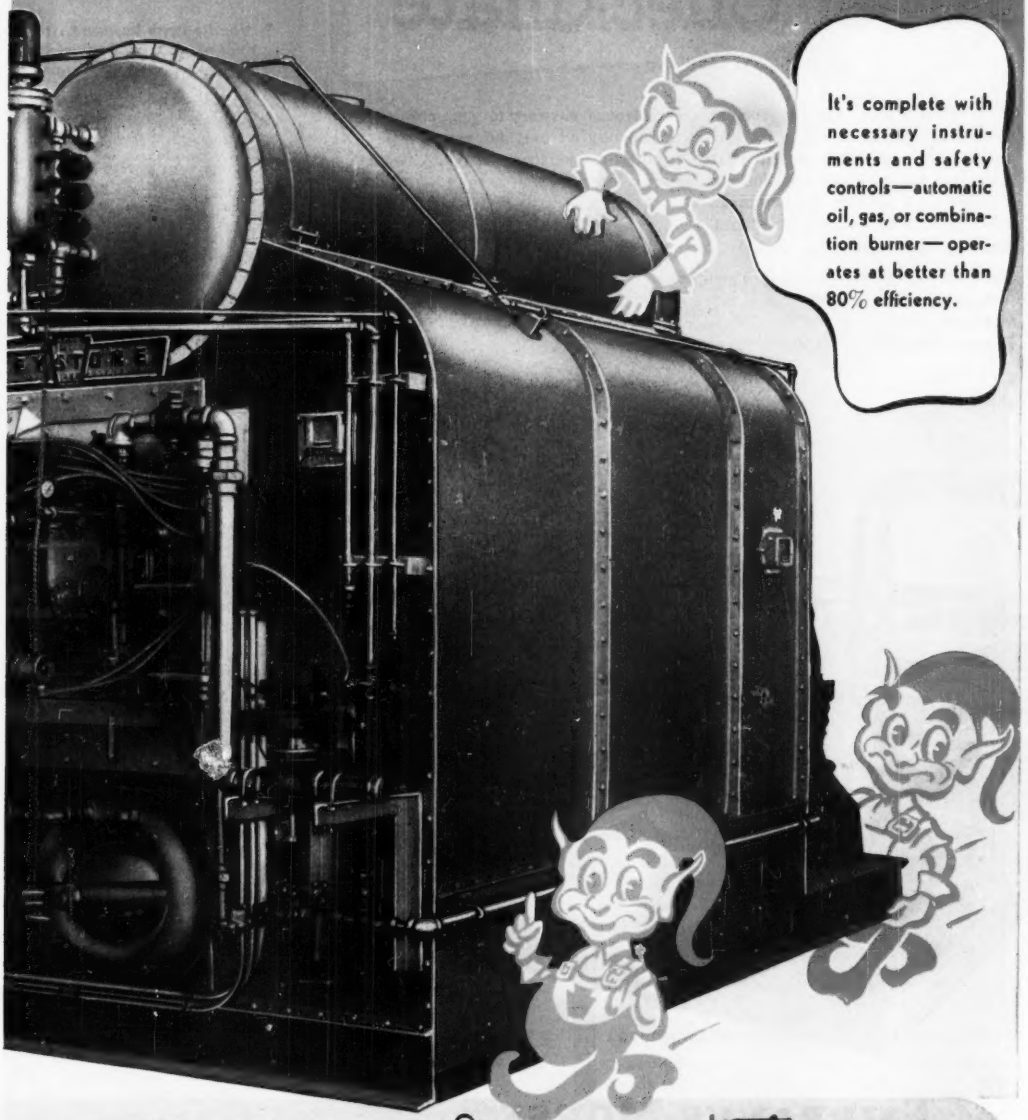


ERIE CITY IRON WORKS • ERIE, PA.

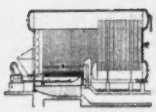
STEAM GENERATORS • SUPERHEATERS • ECONOMIZERS • AIR PREHEATERS
UNDERFEED and SPREADER STOKERS • PULVERIZERS

TO ORDER

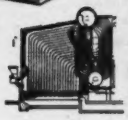
— NO COSTLY STACK — INSTALLS INDOORS OR OUTDOORS



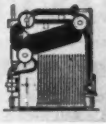
It's complete with necessary instruments and safety controls—automatic oil, gas, or combination burner—operates at better than 80% efficiency.



ERIE CITY VL horizontal 2-drum integral furnace, steel cased steam generators.



ERIE CITY VC vertical 2-drum integral furnace, steel cased steam generators.



ERIE CITY TYPE "C" 3-drum steam generators.

FAIRBANKS-MORSE DIESELS CAN ELIMINATE YOUR

Power Checkmate

Poor power factor, adverse current characteristics, surge loads . . . any one of these conditions can put your plant in a power checkmate. You are then paying a penalty that can mean the difference between profit and loss.

What's the Next Move in *Your* Plant?

Look at your power problem. Then look at this representative list of advantages brought to you by Fairbanks-Morse Diesel power generation. These are *proved* answers to your problem . . . based on over 50 years' experience in industrial and municipal power generation.

If power has you in a checkmate, write us today, outlining your problem. Fairbanks-Morse Engineering can help decide your next move to put power costs and performance in order. Fairbanks, Morse & Co., Chicago 5, Ill.

Put Your Power Costs and Performance in Order

1 ***Handle Peak Demand*** . . . reduce peak demand values for lower purchased power rates.

2 ***Power Factor*** . . . in-plant power generator can eliminate power factor penalties.

3 ***Emergency Power*** . . . insurance against lost production and damage resulting from line failures.

4 ***Handle Surge Loads*** . . . that may now be affecting current characteristics of entire plant.

5 ***Plant Expansion*** . . . need not be restricted due to lack—or expense—of ample power.

6 ***Useful Heat*** . . . lube oil, water and exhaust heat can be turned from waste to profit.

7 ***Chemical Value*** . . . exhaust gases are high in free nitrogen—available for economical fixation of nitrates, ammonia, etc.

8 ***Insurance Advantage*** . . . of diesel over gasoline engine, for example, will soon pay for installation.

9 ***No Weather Worries*** . . . ice, snow, sleet, wind storms can't stop plant operations.

10 ***Handle Increasing Load*** . . . in-plant power economically adds to current capacity as loads increase.

11 ***Fuel Economy*** . . . use diesel oil, natural gas or sewage gas for added economy.

12 ***Remote Locations*** . . . distance from transmission lines needn't curtail plant expansion.

13 ***More Compact Power*** . . . Fairbanks-Morse engines give you more power per foot of floor space, more power on present foundation.

14 ***Minimum Attendance*** . . . Fairbanks-Morse in-plant generating sets require far less supervision or maintenance.

15 ***Save Cost*** . . . of running in new line where present transformers and power lines are already loaded.

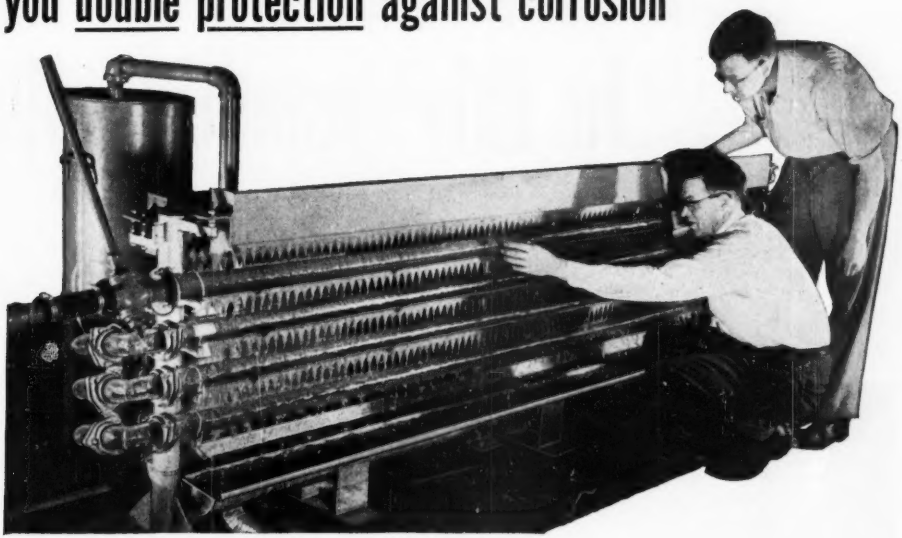
FAIRBANKS-MORSE,

a name worth remembering

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • ELECTRICAL MACHINERY • PUMPS • SCALES • RAIL CARS • MAGNETOS • FARM-MACHINERY

Only PYREX® CASCADE COOLERS

give you double protection against corrosion



❶ Stop chemical attack inside tubes

❷ Permit use of low cost water as coolant

You're doubly protected against corrosion—doubly assured of processing economies with PYREX brand Cascade Coolers. First, you can count on long service life with low replacement costs because of their exceptional resistance to practically all liquids. Second, you can use low cost sea or river water as a coolant. Then, too, PYREX Cascade Coolers offer you:

DURABILITY—They withstand rapid temperature changes and mechanical shock and the corrosive action of chemicals.

ASSURED PRODUCT PURITY—They provide positive protection for CP chemicals, drugs, foods and other products susceptible to contamination.

FURTHER ECONOMY—Low in first cost per BTU transferred, PYREX brand Cascade Coolers have "glass-smooth" surfaces which resist scale formation—keep efficiency up . . . cleaning and maintenance costs down.

HIGH VERSATILITY—You can mount them on floor, wall or ceiling to conserve space—use them in series or parallel. Shipped complete, an eight-tube unit requires only a few hours for assembly by your own men.

Handy nomographs and tables to help you compute your heat transfer requirements, along with a complete description of PYREX Cascade Coolers are included in Corning's new Technical Bulletin PE-8. Send for your copy today. Mail the coupon below.

PYREX

CORNING GLASS WORKS
CORNING, NEW YORK

Corning means research in Glass

Visit the new Corning Glass Center

CORNING GLASS WORKS, Dept. CE-7, Corning, N.Y.

Please send me a copy of Technical Bulletin PE-8, "PYREX Cascade Coolers" and name of nearest distributor.

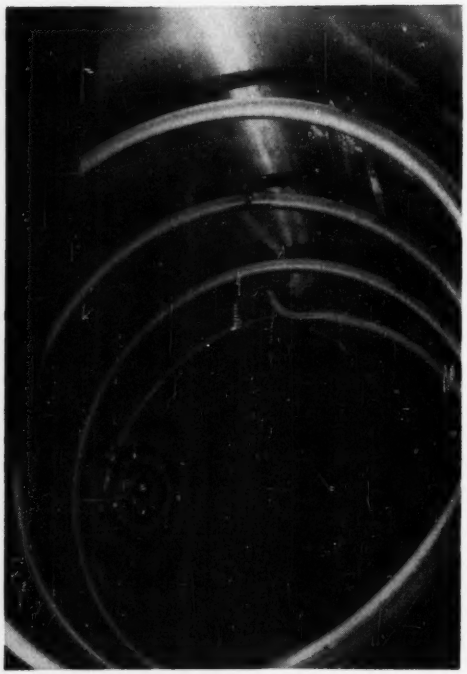
NAME ..... TITLE .....

FIRM .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

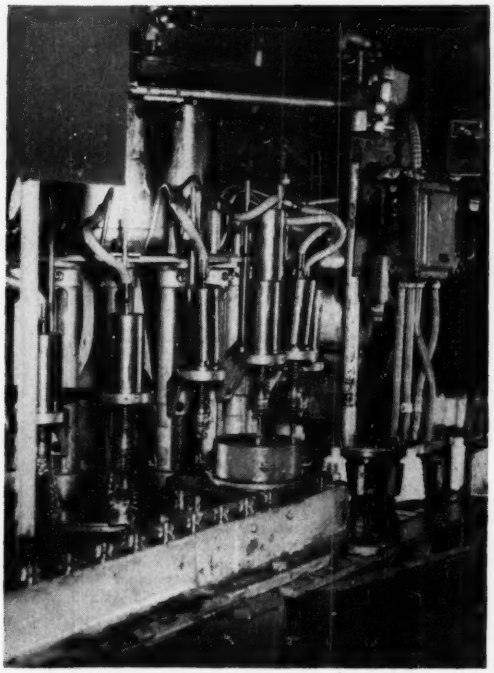
In this cosmetics plant



INTERIOR VIEW of one of the 2000-gallon mixing tanks shows the Stainless Steel coils and agitator.

HELENE CURTIS products are mixed in the Stainless Steel tanks shown above. They range in capacity from 500 to 2000 gallons. Four 160-gallon pre-mixing tanks are also Stainless Steel. All this equipment was fabricated by Erb Manufacturing Co., Chicago, Ill.

95% of the process equipment is STAINLESS STEEL



BOTTLE FILLING takes place in these automatic, rotary, vacuum-type bottle fillers. Stainless Steel is used for the supply reservoir, the cylinders and surface plates of the bottle conveyor.

TO HANDLE the highly concentrated ingredients used in manufacture of its shampoos, hair lotions, permanent wave preparations and similar cosmetic items, Helene Curtis Industries relies heavily on Stainless Steel—to such an extent, in fact, that 95% of all vessels used in process operations at the firm's Chicago plant are Stainless Steel.

The reasons, according to Planning Engineer Lester Dickerhofe, lie in Stainless Steel's exceptional resistance to corrosion, its smooth, durable surface that can't break or slough off, its ease of cleaning that makes product changes in the same equipment less time consuming and more easily controlled.

The bulk of the Helene Curtis products are mixed in five tanks of 2000 gallons each and six tanks of 500 gallons each. The large tanks are equipped with Stainless Steel steam coils that keep contents at 140° F. Stainless propellers provide agitation.

Mixed cosmetics are transferred to Stainless storage tanks by means of Stainless Steel positive displacement-type pumps, equipped with Stainless filters. Finally the products are packaged by automatic, rotary, vacuum-type fillers in which Stainless Steel is used for the supply reservoir, cylinders and surface plates of the bottle conveyor.

The benefits of Stainless Steel are recognized widely in the chemical process industries. In many applications, there's simply no substitute. It will pay you to examine your operations to see where Stainless can cut costs and increase efficiency.

And when you order Stainless equipment, specify U·S·S Stainless Steel. It will give you the finest performance.

UNITED STATES STEEL COMPANY, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

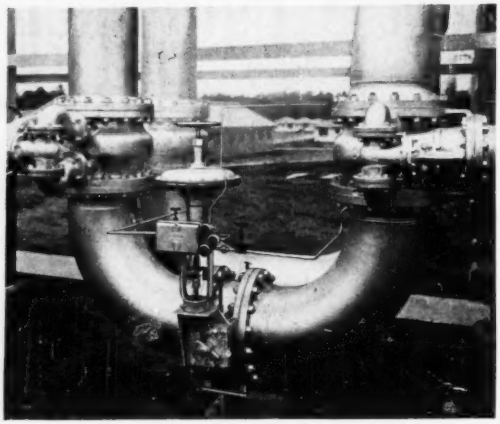
USS

2-1221

UNITED STATES STEEL

R-S valvEvents

• EXCERPTS FROM THE R-S BOOK OF EXPERIENCE •



R-S Automatic Valve installed on water jacket to gas engine in gas booster station.

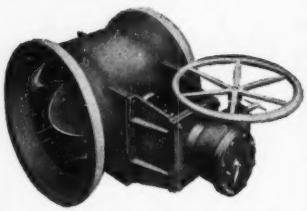
WIDE RANGE of Application

R-S Valves are used in air, gas, liquid, steam, and semi-solid service for the shut-off and regulation of volume and pressure, pressure relief, liquid level control, back pressure, water hammer, steam hammer, constant differential pressure, and the output control of pumps, fans, engines and turbines. Suitable for service in the temperature range from minus 300° to plus 2000° F. 2 to 2500 psig.

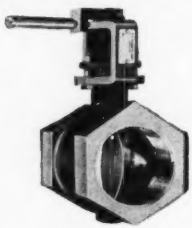
Simplicity of design, ease of operation, positive rubber seat shut-off, and the wide range of application indicate the high order of metallurgical and mechanical engineering that is embodied in every R-S valve.

Consult your local R-S Valve Engineers, or write direct.

R-S PRODUCTS CORPORATION
4600 Germantown Avenue, Philadelphia 44, Pa.
An S. Morgan Smith Company Subsidiary
DISTRICT OFFICES IN PRINCIPAL CITIES

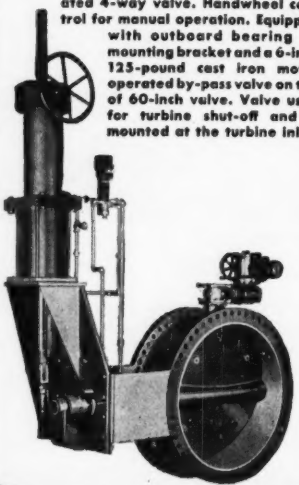


No. 836—24-inch 125-pound cast iron hub-end valve with bronze liner and monel periphery on vane for water service. Equipped with totally enclosed gear reducer, handwheel and locking device.



No. 801—3-inch 125-pound bronze screwed-end valve with handlever control and locking device.

No. 828—60-inch 150-pound cast steel valve with 18-8 shafts, bronze bushings and bronze body liner. Cylinder operator is controlled by electric motor operated 4-way valve. Handwheel control for manual operation. Equipped with outboard bearing on mounting bracket and a 6-inch 125-pound cast iron motor operated by-pass valve on top of 60-inch valve. Valve used for turbine shut-off and is mounted at the turbine inlet.



STOP DOWNTIME...

Cut Handling Costs!

The Gould "Thirty"—
America's Finest
Industrial Truck Battery

It costs real money when a truck goes out of service because of battery failure. There are two sure ways to keep materials moving, men and machines working: 1. Power your trucks with Gould Industrial Batteries; 2. Maintain <u>all</u> your batteries, regardless of make, with the Gould Plus-Performance Plan. This *free* system of preventive maintenance is making money for hundreds of industrial firms by helping them keep their batteries new, longer.

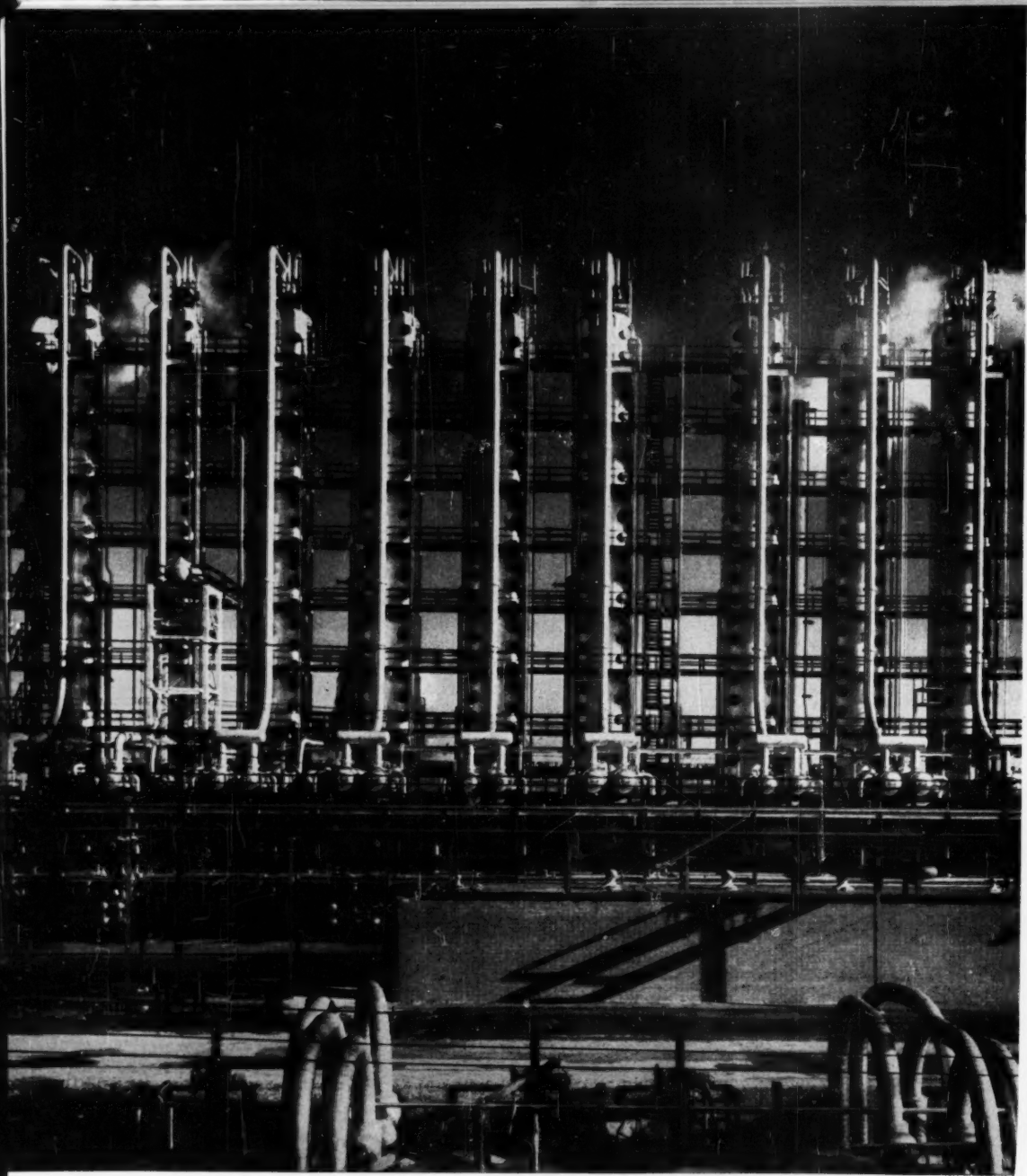
It will pay to learn more about Gould Industrial Truck Batteries and the Gould Plus-Performance Plan. Write Gould Battery Information Headquarters for full information.

GOULD
Industrial Batteries

GOULD-NATIONAL BATTERIES, Inc., TRENTON 7, N. J.

Always Use Gould-National Automobile and Truck Batteries

ENGINEERING

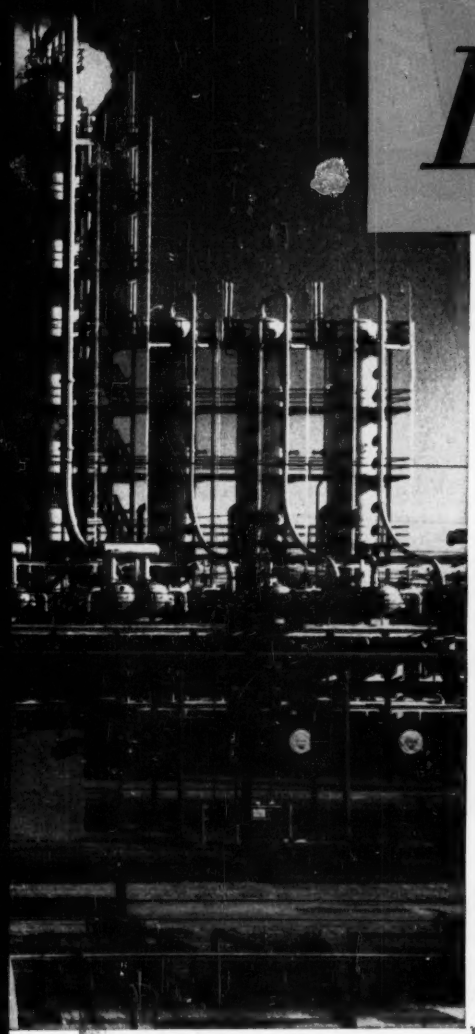


C F BRAUN & CO

Engineers

ALHAMBRA CALIFORNIA

NEW YORK • CHICAGO • HOUSTON • SAN FRANCISCO



ENGINEERING FABRICATION CONSTRUCTION BY

BRAUN

Serving the Chemical Industry today—some $200,000,000 of chemical-processing plants, engineered and constructed by Braun. The plants are in broadly diversified fields, indicated by the primary products listed below.

Acetone
Allyl alcohol
Allyl chloride
Alumina
Benzene
Butadiene
Catalysts
Cumene
Diacetone alcohol
Dichlor butane
Elemental sulphur
Ethanolamines
Ethyl chloride
Ethylene
Ethylene dichloride
Higher alcohols
Hydrogen sulphide
Isopropyl alcohol
Isopropyl ether
Mesityl oxide
Methyl ethyl ketone
Methyl isobutyl carbinol
Methyl isobutyl ketone
Naphthalene
Perchlorethylene
Secondary butyl alcohol
Synthetic ethyl alcohol
Synthetic glycerine
Tetraethyllead
Toluene
Vinyl chloride
Xylenes

Established in 1909, and serving the chemical industry, the petrochemical and petroleum industries, Braun provides a worldwide engineering and construction service—and a worldwide research and consulting service.

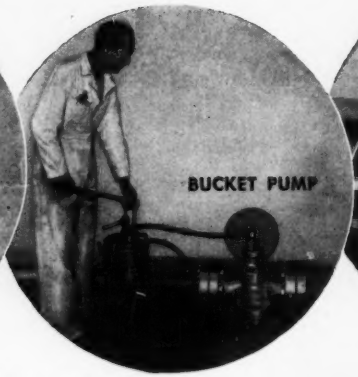
Announcing

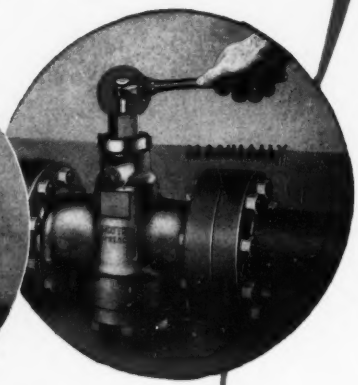
The NEW ROCKWELL FITTING

For Nordstrom Hypreseal Valves

A COMBINATION LUBRICANT SCREW AND GIANT BUTTON HEAD FITTING

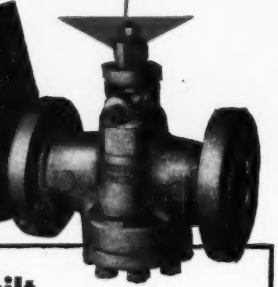
NOW Nordstrom Hypreseal Valves Can Be Lubricated *WITHOUT INTERCHANGING PARTS* By These Three Methods . . .





To meet the growing demand for hand gun and bucket pump lubricating equipment, Rockwell Manufacturing Company has developed a new fitting for Nordstrom Hypreseal valves which is adaptable to any method of lubrication. Now furnished at no additional charge with all Nordstrom Hypreseal valves, the new fitting eliminates the bother and cost of purchasing giant button head fittings for hand gun or bucket pump lubrication. The new Rockwell fitting is also available as a separate unit to replace the lubricant screw on Nordstrom Hypreseal valves now in service. For further information contact your Nordstrom representative or write to Rockwell Manufacturing Company, 400 North Lexington Ave., Pittsburgh 8, Pa.

Now Standard Equipment on all Nordstrom Hypreseal Valves



ROCKWELL Another ROCKWELL Product **Built Nordstrom Valves**

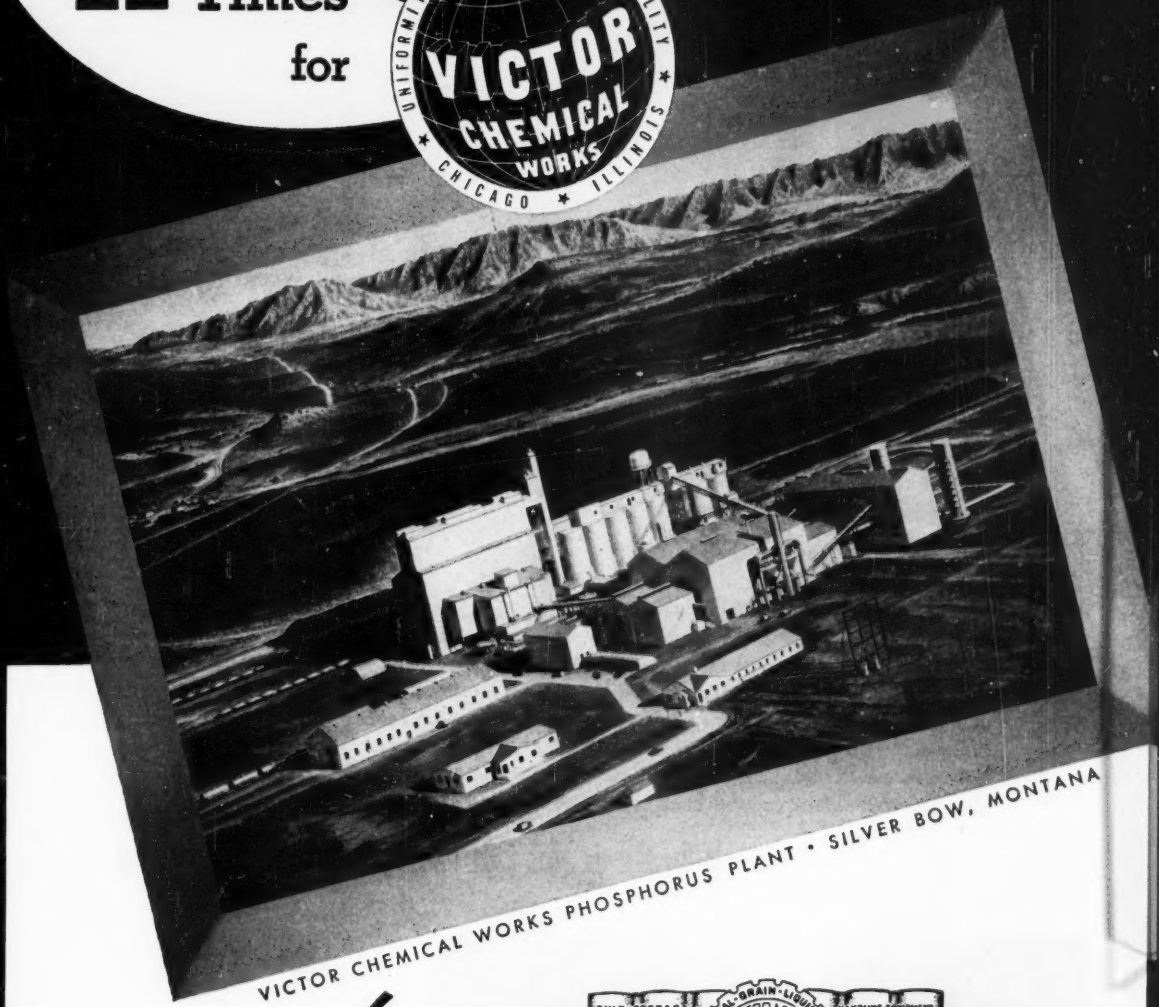
LUBRICANT SEALED FOR POSITIVE SHUT-OFF

11 Times for

UNIFORMITY ★ PURITY ★ STABILITY

VICTOR CHEMICAL WORKS

CHICAGO ★ ILLINOIS



VICTOR CHEMICAL WORKS PHOSPHORUS PLANT • SILVER BOW, MONTANA

by

BULK STORAGE · COAL · GRAIN · LIQUIDS · STORAGE · HANDLING EQUIPMENT

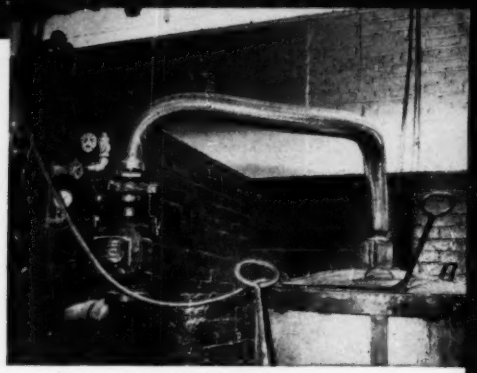
THE NICHOLSON CO.

CONSTRUCTION · CEMENT · OIL · CHEMICALS

11 TIMES — Victor Chemical Works has chosen *The Nicholson Co.* to build its ever expanding facilities. In your expansion or new construction take advantage of the NICHOLSON complete plant construction service as well as its 40 years of specialized design and building experience in the field of bulk materials storage and handling facilities.

10 ROCKEFELLER PLAZA • NEW YORK 20, N. Y.

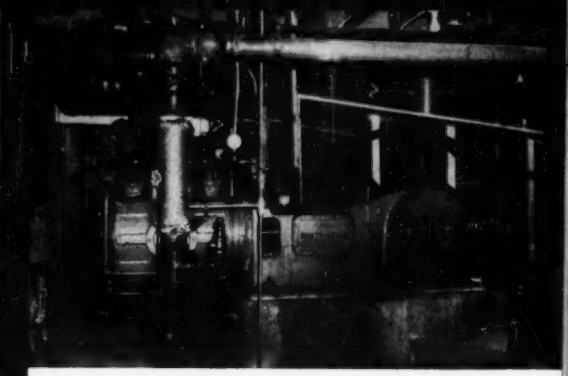
IF the connection must move . . .



use CMH flexible metal hose

In conveying materials—liquids, gases or dry granular solids—between two movable points, metal hose combines rugged durability with the required flexibility. In addition, metal hose is non-aging, non contaminating and non-collapsible. It offers high resistance to heat, cold and physical damage, giving excellent service under all conditions.

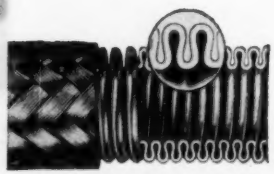
IF the connection vibrates . . .



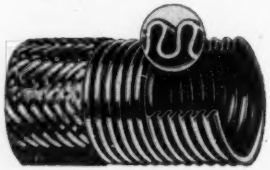
use CMH flexible metal hose

Connections subject to vibration will last longer if they are made with flexible metal hose. Equipment and rigid piping will last longer, too, because metal hose isolates the vibration, restricting it to that portion of the equipment that is built to absorb the vibration. Transmission of noise is minimized also, with metal hose connections.

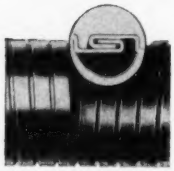
There is a size and type



CMH REX-WELD corrugated steel and bronze hose is available in standard sizes from 3/16" through 12" I.D. for burst pressures to 12,000 psi, temperatures to 1000° F. Available with or without metal braid covering.



CMH REX-FLEX corrugated stainless steel hose is available in standard sizes from 5/16" through 6" I.D. for burst pressures to 24,000 psi, temperatures to 1600° F. Available with or without metal braid covering.



CMH REX-TUBE fully interlocked flexible tubing for ducting, exhaust, armor etc. is available in galvanized steel, aluminum, brass and other metals in sizes 1/2" through 12", I.D.

Descriptive literature available on all CMH hose types.

CHICAGO METAL HOSE

1317 S. Third Avenue Maywood, Illinois

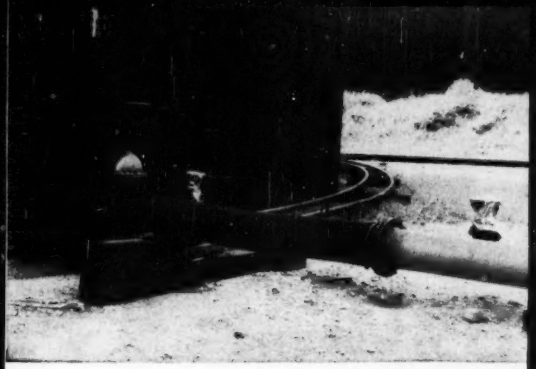
In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

Manufacturers of Flexible Metal Hose, Metallic Bellows,

CMH

Flexon identifies CMH products that have served industry for over 50 years

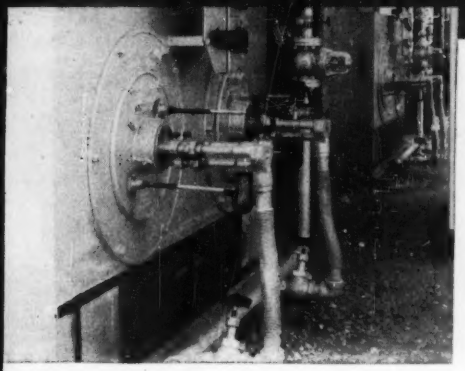
IF the connection is misaligned . . .



use CMH flexible metal hose

Joining misaligned sections of piping is greatly simplified when flexible hose is used to bridge the gap. Savings in assembly time and in fittings generally will pay the cost of the hose. At the same time, metal hose provides a neater installation that is practical, efficient and completely leaktight and dependable.

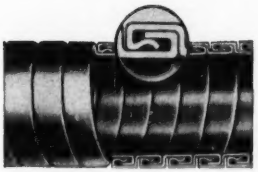
IF the connection absorbs expansion . . .



use CMH flexible metal hose

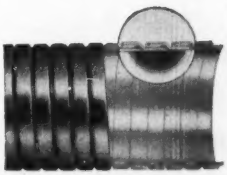
In the many types of equipment where thermal changes cause expansion and contraction, the motion is easily absorbed by flexible metal hose without sacrificing any of the tightness or dependability of the connection. Flexible metal hose makes it possible to solve an otherwise difficult problem quickly, simply and economically.

to meet every need . . .



CMH REX-TUBE fully interlocked flexible metal hose for steam, tar and asphalt, grease, etc. is available in galvanized steel or bronze in standard sizes from ⅛" to 12", I.D.

CMH REX-TUBE ball bearing type utility hose for non-searching fluids is available in bronze, galvanized steel or stainless steel in standard sizes from 9/32" through 1¼", I.D. Available with or without metal braid covering.



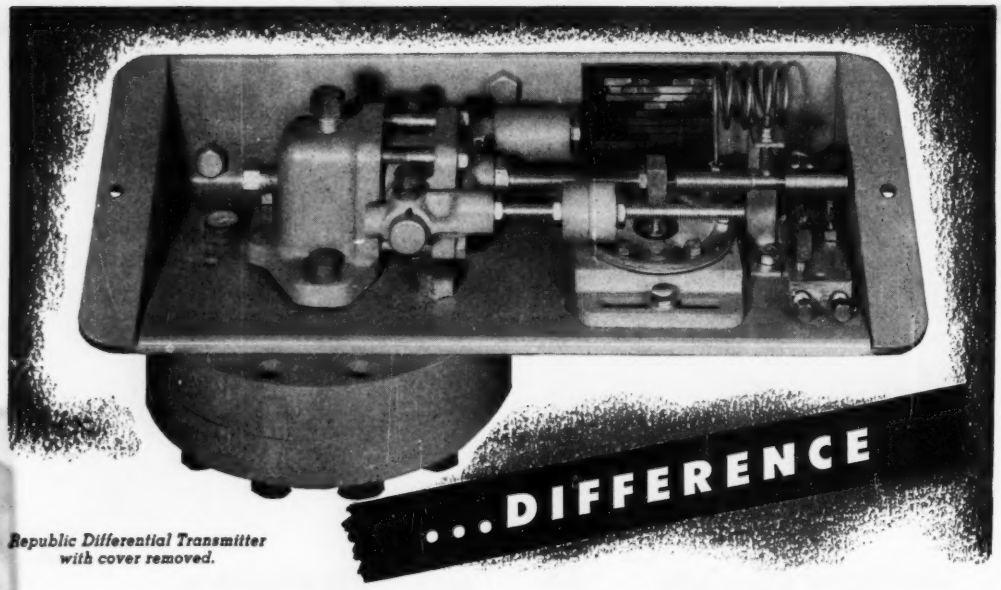
CMH "Abrasion Resistant" flexible galvanized steel tubing is especially designed for handling dry granular solids such as grain, slag, ashes, etc. Standard sizes 2½" through 12", I.D

See your classified telephone directory for the distributor nearest you.

Division, Flexonics *Corporation*

Plants at Maywood, Elgin, Rock Falls and Savanna, Illinois and Memphis, Tennessee

Expansion Joints for Piping, and Aircraft Components



Republic Differential Transmitter with cover removed.

Spells *PLUS* PERFORMANCE

The Republic Pneumatic Transmitter combines machine ruggedness with instrument precision to provide matchless performance in measuring flow, level, pressure or density of a wide variety fluids. By any or all of the following points, the Republic challenges comparison:

ACCURACY of the Republic force-balance principle is higher than can be consistently secured and maintained with any other method. 1/2 of 1% guaranteed.

TEMPERATURE variations of ambient atmosphere have negligible effect on the accuracy of the Republic transmitter.

CHANGES IN AIR SUPPLY PRESSURE do not affect the accuracy of a Republic transmitter to any significant extent. A 5 psi change produces an error of less than 1/10%.

CHANGES IN LINE PRESSURE—Republic differential transmitters are not affected by variations in line pressure. A patented and exclusive simple adjustment assures this protection.

SENSITIVITY—Due to the negligible motions required for complete operation of all parts, for a full scale change, no appreciable hysteresis results from reversal of direction of measurement change.

VIBRATION of any normal frequency has no effect on the Republic transmitter.

LEVELING—Since all parts are balanced, and no liquid is used for calibration, Republic transmitters need not be leveled exactly, and may be adjusted for installation in any position.

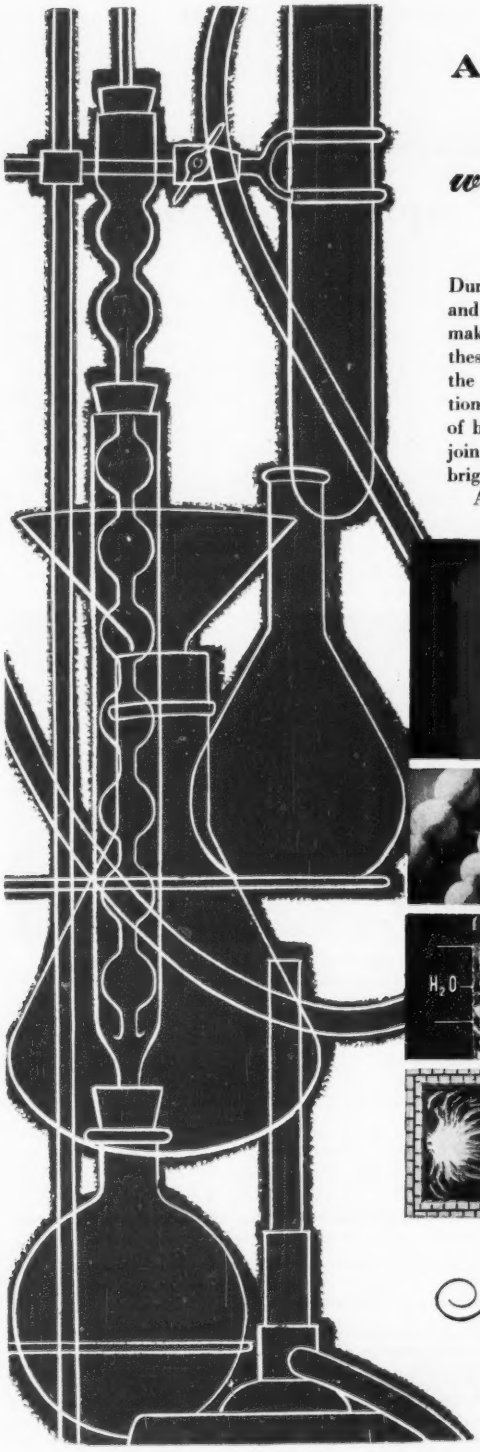
FOR TWELVE YEARS Republic Pneumatic Transmitters have delivered unmatched performance in every type of installation. Complete details of design and operation, plus numerous application suggestions are combined in Data Book, 1002. Send for your copy, today.

REPUBLIC FLOW METERS CO.
2240 Diversey Parkway, Chicago 47, Illinois

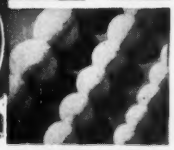
ALCOA CHEMICALS

. . . partners in progress with the chemical and process industries

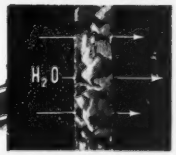
During the last 50 years of unprecedented progress, the chemical and process industries have discovered ALCOA Chemicals make "good partners for good products." Remarkably versatile, these Aluminas and Fluorides have gone hand-in-hand with the Industry's progress—working wonders, increasing production, improving quality, reducing costs. They have a wide scope of beneficial applications. We'll gladly tell you how they can join you in a partnership that will make your future increasingly bright. ALCOA Aluminas are readily available. Write to:
ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION,
602-G Gulf Building, Pittsburgh 19, Pa.



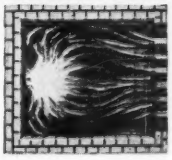
What catalyst does your reaction require? Granular, fluidized, sorptive, non-sorptive, porous, dense, active or neutral? There's an ALCOA Activated, Tabular or Calcined Alumina to up-grade your catalytic process yields . . . reduce losses from contamination and side reactions.



What are your bed-support and cover problems? ALCOA Tabular Alumina Balls are chemically and thermally stable and catalytically neutral. They offer economy . . . adaptability . . . better operation of your reactor towers.



What do you dry? How dry do you want it? ALCOA Activated Alumina is one of the oldest, most reliable, thoroughly proved desiccants for the dehydration of liquids, gases and vapors.



What temperature does your process require? Refractories fortified with ALCOA Alumina will withstand the highest temperatures . . . last the longest . . . resist spalling and corrosive slags and gases. And this performance *goes up* with the ALCOA Alumina content!

Alcoa Chemicals

ALCOA

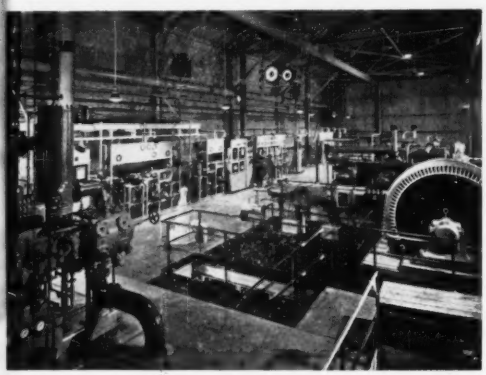
ALUMINAS and FLUORIDES

ACTIVATED ALUMINAS • CALCINED ALUMINAS • HYDRATED ALUMINAS • TABULAR ALUMINAS • LOW SODA ALUMINAS ALUMINUM FLUORIDE • SODIUM FLUORIDE • SODIUM ACID FLUORIDE • FLUOBORIC ACID • CRYOLITE • GALLIUM

A Brief Report on Hooker Chemicals and What Hooker People Are Doing

COMPANY PLANS $25 MILLION EXPANSION—Plans for a $25 million expansion program were announced by the company May 20. The program includes a $10 million chlorine and caustic soda plant to be erected at Montague, Mich.; expansion of chlorine and caustic capacity at the Tacoma, Wash. plant; and numerous additions and improvements at the Niagara Falls, N. Y. plant.

In the six years ended November 30, 1951, Hooker spent about $23 million on plant expansion. By the end of 1953, current expansion plans will bring Hooker's gross plant and equipment value to four times what it was in 1945.



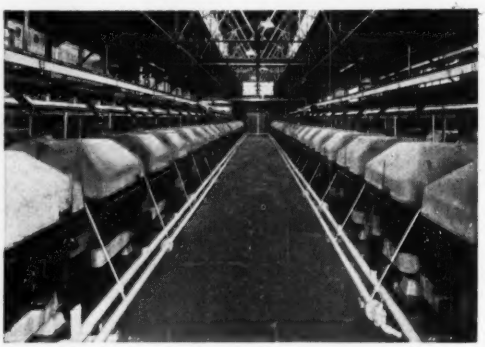
ANHYDROUS AMMONIA PLANT at Tacoma, Washington started production this year.

PACIFIC NORTHWEST'S FIRST AMMONIA PLANT IN OPERATION—The first anhydrous ammonia plant in the Pacific Northwest has just been completed at Tacoma. Output of this new Hooker plant is being used by the chemical and the pulp and paper industries in this area.

HOOKER TO OPEN CHICAGO OFFICE—On or about August 1, the company will open a new sales office at 1 LaSalle St. in the heart of Chicago's bustling Loop to accommodate Midwestern users of chlorine, caustic soda and other industrial chemicals.

NEW CELLS BOOST CHLORINE, CAUSTIC OUTPUT—Chlorine and caustic soda production was greatly increased during 1951 by replacing Hooker Type "S" electrolytic cells with newer "S-3" cells. The "S-3" cell produces 1340 pounds of chlorine and 1520 pounds of caustic soda a day—roughly twice the capacity of the "S" cell.

Total U.S. chlorine capacity increased about 1300 tons per day in 1951. Approximately 40% of all domestic chlorine is now produced in Hooker cells.



HOOKER TYPE "S-3" CELLS produce a large part of the chlorine and caustic soda used in the United States.

NEW HOOKER PRODUCTS

During the past year Hooker has increased and improved production of many products and its research laboratories have completed development of a number of new products.

LINDANE production was improved during 1951 by a new method which makes possible full recovery of valuable benzene and chlorine, formerly waste products of the operation. Hooker is presently the only large scale commercial manufacturer of Lindane.

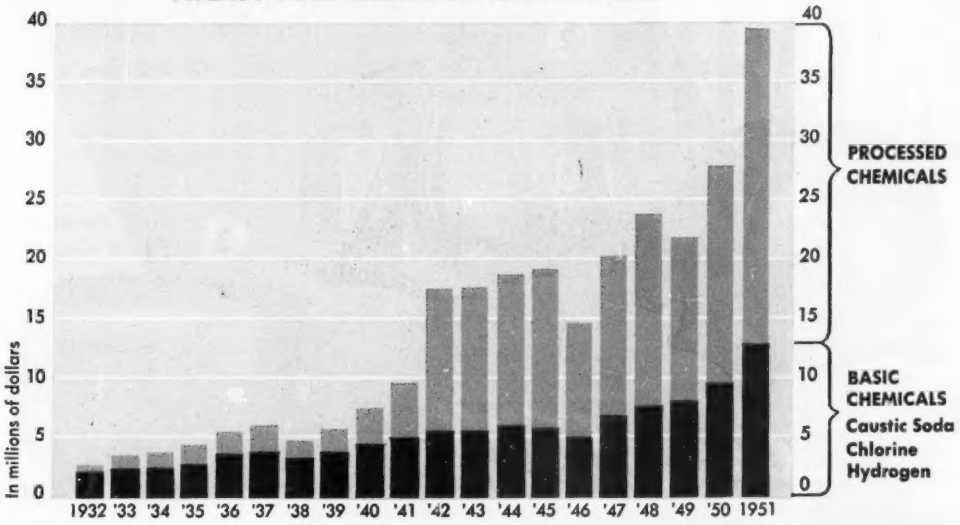
SODIUM TRICHLOROACETATE weed killer was brought into commercial production during the past year.

1, 2, 4, 5-TETRACHLOROBENZENE, a new Hooker product is used in the manufacture of weed killers for ridding large areas of shrubs and woody plants.

C-56 (hexachlorocyclopentadiene), a versatile intermediate for chlorinated organic insecticides. A wide range of other uses is indicated.

FLUOROLUBES®, extremely stable addition polymers with resistance to oxidation and heat. They constitute a new and important group of high stability lubricants, sealants, hydraulic and heat exchange fluids.

TWENTY YEAR CHEMICAL PRODUCTS SALES



SALES CHART shows how new products have contributed to the growth of the company. They now account for almost 70% of sales.

BENZOTRIFLUORIDES, like Fluorolubes are a result of Hooker fluorination research. Benzotrifluorides are finding commercial application in intermediates for new superfast dyes.

MPS®-500, a new plasticizer for vinyl chloride formulations, imparts flame retardance, good electrical properties and other desirable qualities to vinyl compositions for sheeting, and electrical wire coating. Another advantage is the relatively low cost of MPS-500 in comparison with other plasticizers.

OTHER NEW PRODUCTS, useful in non-inflammable plastics are being readied for commercial production. These will be announced shortly.

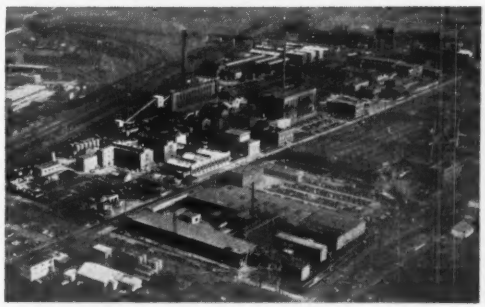
NEW COMPOUND CUTS METAL CLEANING TIME

Chemical equipment users and metal working industries are finding wide use for Virgo® Molten Cleaner. This recently developed Hooker product removes paint, dirt, rust, chemical impurities, graphite and sand from metal castings in 10 to 20 minutes.

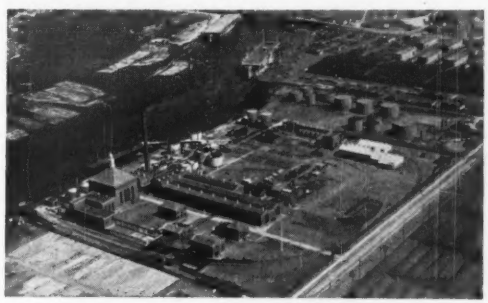
Virgo Molten Cleaner is used in the form of a molten bath to clean forgings, castings and fabricated parts, including chemical equipment. Its companion product, Virgo® Descaling Salt is used by metal producers and the metal working industries for fast, safe, low cost descaling of stainless and alloy materials.

☆ ☆ ☆

FOR A DESCRIPTIVE LIST of Hooker Chemicals which are used by more than 30 industries, ask for Bulletin 100, General Products List. Please write on your business letterhead to HOOKER ELECTROCHEMICAL COMPANY, 5 Forty-seventh Street, Niagara Falls, N. Y.



IN THE 46 YEARS since 1906 Hooker has grown from a shanty in a pear orchard to two large modern industrial plants at Niagara Falls, N. Y. (above) and at Tacoma, Wash. (below) producing chlorine, caustic soda and related products. Another plant will be built at Montague, Mich. in 1953.



From the Salt of the Earth

HOOKER ELECTROCHEMICAL COMPANY

HOOKER® CHEMICALS

5 FORTY-SEVENTH ST., NIAGARA FALLS, N. Y.
New York, N. Y. • Wilmington, Calif. • Tacoma, Wash.

Let You Forget About Atmospheric Hazards

Shown here are four basic types of Century Protected Motors which are designed to resist the dangers of hazardous atmospheres. A properly selected Century motor—with the right protection—is the ideal combination for a long life of satisfactory performance.

1 **Open Protected**—Form J, general purpose motor—meets the needs for most installations where operating conditions are relatively clean and dry. The top half of the motor frame is closed to keep out falling solids or dripping liquids.

2 **Splash Proof Motor**—gives the necessary protection where plants must be washed down—keeps water out of the motor even when a hose is applied directly on the frame. It also provides protection against rain, snow, sleet and ice for outdoor installations.

3 **Totally Enclosed Fan Cooled Motor** — protects against dusts, mist or fog that might be detrimental to the vital parts of the motor. The inner frame protecting the motor is sealed to keep out harmful matter.

4 **Explosion Proof Motor** — protects against atmospheres charged with explosive dusts or gases. They carry Underwriters' label for specific kinds of hazards.

Century builds a complete line of alternating and direct current motors in a wide range of types and kinds — in sizes from 1/8 to 400 horsepower.

Specify Century motors for all your electric power needs.

Century C MOTORS

632

CENTURY ELECTRIC COMPANY 1806 Pine Street • St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

free TECHNICAL LITERATURE

1. STANDARD PRACTICE SP-42 . . . Eight page folder listing detailed specifications for 150# corrosion resistant cast flanged valves, flanges and flanged fittings.

2. VALVE COMPARISON CHARTS . . . Four page charts comparing design features of leading competitive 2" and ¾" stainless steel gate valves.

3. FLOW DIAGRAMS . . . Four page folder describing basic stainless steel valve designs in terms of fluid flow. Uses and limitations of each major type are discussed.

4. MATERIALS SELECTION CHART . . . Four page chart designed to assist in the selection of the most economical alloy for a given corrosive problem. More than 350 specific corrosives are included.

5. ALLOY REFERENCE CHART . . . Six page pamphlet listing alloy designations, applications, properties and analysis of corrosion and heat resisting alloys.

6. HOW TO GET THE RIGHT VALVE . . . Eight page folder giving information needed to enable manufacturer, supply company or sales representative to fit the proper valve for the application. Tells user or buyer how to get what he needs when ordering a valve.

7. CAST STAINLESS STEEL IN THE PAPER INDUSTRY . . . Eight page folder describing how stainless steel castings, valves and fittings are used to beat corrosion in the paper industry

8. THREADING STAINLESS STEEL . . . Four page folder describing specific high production machining operations on stainless steel valve parts. Speeds, cutting angles, coolants and tooling are discussed.

9. HIGH TEMPERATURE CHARACTERISTICS . . . Technical data chart giving high temperature characteristics of heat resistant alloys.

10. PROPERTIES OF CAST STAINLESS ALLOYS . . . Technical data chart giving designations, composition, mechanical and physical properties of cast stainless alloys.

11. MOLYBDENUM BEARING STAINLESS CASTINGS . . . Four page folder discussing the properties and applications of molybdenum bearing cast stainless alloys.

12. USES FOR CAST MONEL . . . Eight page booklet describing properties and applications of cast monel.

13. WHAT TYPE HIGH ALLOY CASTINGS . . . Four page folder describing selection of alloy types in keeping with government regulations.

14. QUIKUPL STAINLESS STEEL FITTING . . . Technical manual describing design, applications and limitations of revolutionary new type stainless fittings.

15. CATALOG #52 . . . Forty-eight page catalog describing complete line of Cooper Alloy stainless steel valves, fittings and accessories. Includes engineering drawings, weights, dimensions, size ranges, plus valuable material and corrosion data.

16. VALVE TOPICS . . . Technical periodical published bi-monthly for users of stainless steel valves and fittings.

17. NEWSCAST . . . Technical periodical published bi-monthly for users of stainless steel castings.

18. TECHNICAL TOPICS—GENERAL . . . Seven concise technical discussions covering corrosion, magnetism, machining, welding and pickling of stainless alloys.

19. ALLOY TYPE 25-12 . . . Simple technical discussion of the properties and applications of this heat and corrosion resistant alloy.

20. ALLOY TYPE FA-20 . . . Simple technical discussion of properties and applications of special corrosion resistant alloy.

21. 12-14% CHROME TYPE ALLOY . . . Simple technical discussion of the properties and applications of this popular straight chromium alloy.

22. ALLOY TYPE 17-4PH . . . Simple technical discussion of the properties and applications of this hardenable stainless steel alloys.

1	8	15
2	9	16
3	10	17
4	11	18
5	12	19
6	13	20
7	14	21
		22

THE **COOPER ALLOY** FOUNDRY CO. • HILLSIDE, NEW JERSEY

LEADING PRODUCERS OF **STAINLESS STEEL** VALVES FITTINGS AND CASTINGS

Check here for FREE LITERATURE

Name _____

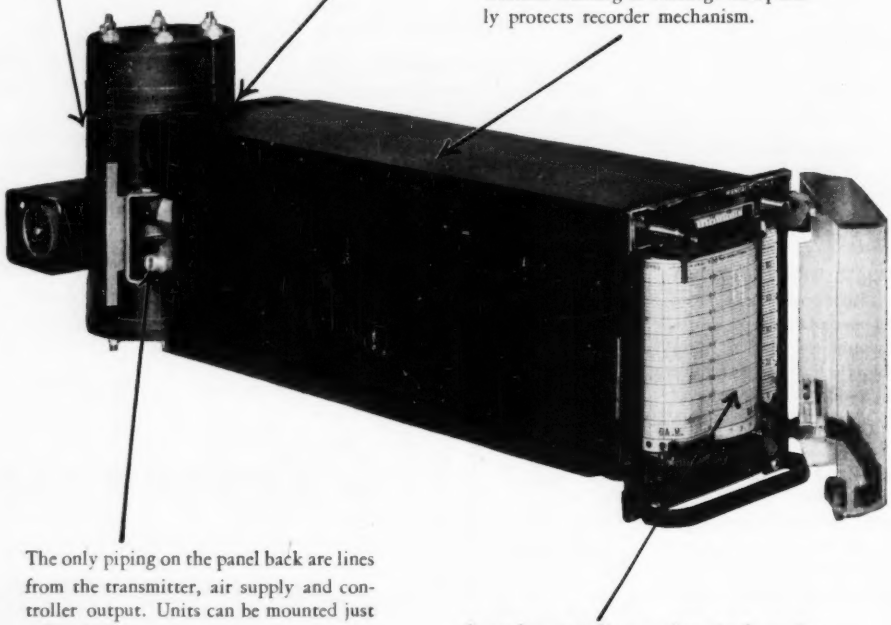
Position _____

Company _____

Address _____

City _____ Zone _____ State _____

Both Controllers and


One common, self-sealing manifold gives plug-in connections to both receivers and controllers!
The plug-in controllers can be removed and replaced with another unit in just 10 seconds.
Rugged steel sleeve clamps on panel, without welding or drilling. Completely protects recorder mechanism.
The only piping on the panel back are lines from the transmitter, air supply and controller output. Units can be mounted just a few inches apart.
Recorder or indicator plugs in from the front—units can be interchanged in just 10 seconds.

Receivers PLUG IN like a radio tube

in Taylor's new Transet® Control System

HERE'S a new and greater TRANSET Pneumatic Control System! It incorporates all the superior control features and control accuracy that has made TRANSET 3-part control such an overwhelming success since its introduction. Now we have *added* all these *new* benefits:

1. All units can be mounted on the panel without welding, without drilling holes.

2. A single mounting is all you need for both controller and recorder or indicator.

3. You can change from simplest to most complex control as easily as changing tubes in a radio, simply pulling out one unit, plugging in a new one.

4. You can change from indicator to recorder, or vice versa, the same way—in only 10 seconds.

5. The only piping connections required are air supply, controller output and to the variable transmitter. All other connections are made automatically, in the self-sealing manifold.

6. You save panel space, because units can be mounted only a few inches apart.

7. You save money, both in labor and materials on installation—thanks to the simplified piping and mounting.

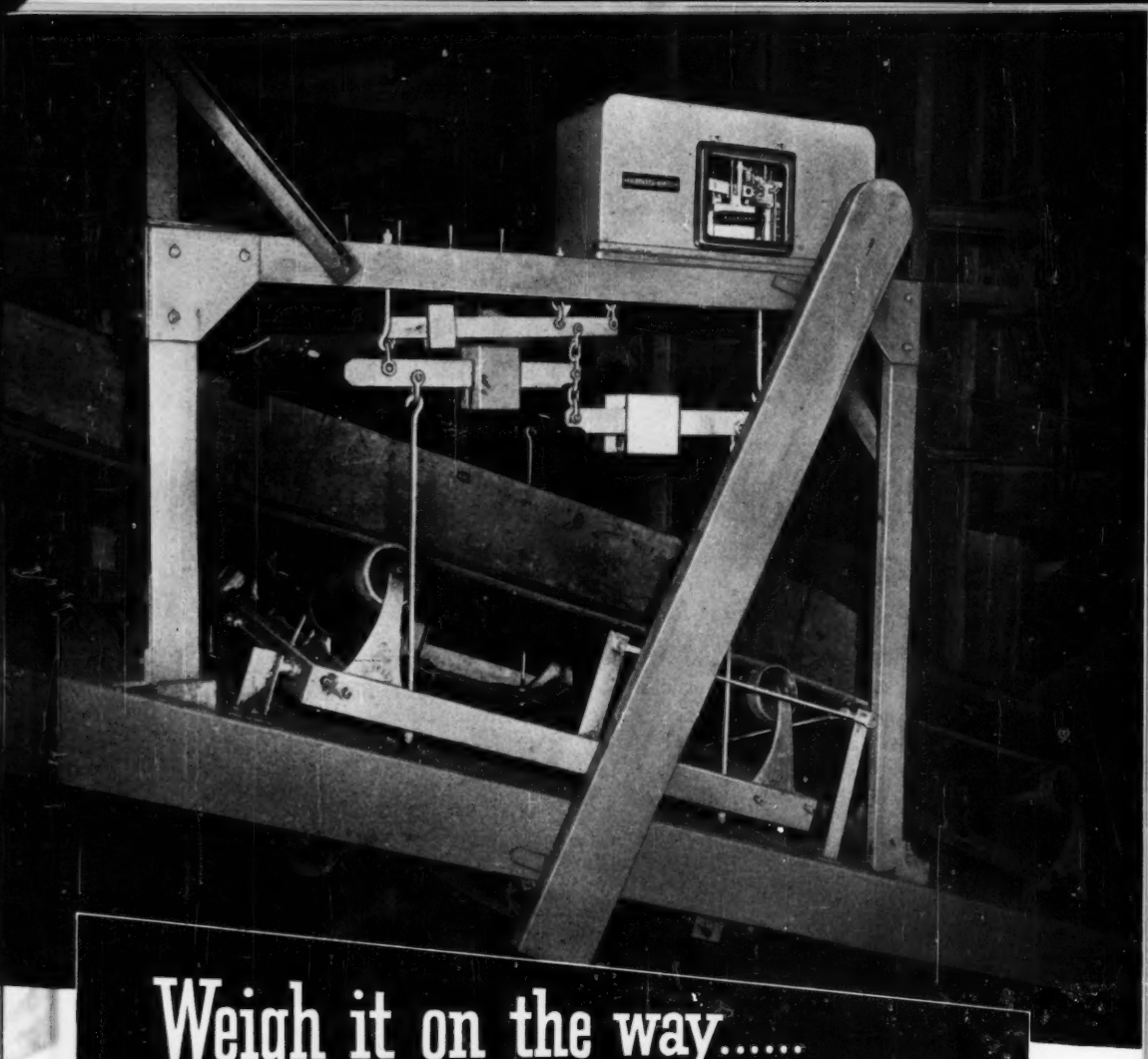
8. All adjustments on the recorder or indicator can be reached conveniently, from the front, without disturbing any connections.

9. Mountings are so rugged, attach to panel so sturdily, that they would support the weight of an average man.

All these features, and many more, have been added to the famous Taylor TRANSET Control System. Before you make any decision involving pneumatic transmission control, be sure to get information on the new and greater plug-in type TRANSET Control. Taylor Instrument Companies, Rochester, N.Y., and Toronto, Canada.

Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY



Weigh it on the way.....

Cut costs and streamline your weighing of bulk materials with this Fairbanks-Morse Belt Conveyor Scale . . . it cuts out extra handling and weighing at a remote point. For example, here it weighs coal *automatically* as it moves from scalping screens to the wash box. This Fairbanks-Morse Scale has a capacity of 700 tons an hour at 400 belt feet a minute, and you can get accumulated totals with the remote tonnage register from a central control room *and* with the mechanically operated register at the scale itself. If you are handling bulk materials on belt conveyors, you'll find it pays to talk to your Fairbanks-Morse Weighing Expert. Or if you prefer, write for complete details to Fairbanks, Morse & Co., Chicago 5, Ill.

FAIRBANKS-MORSE

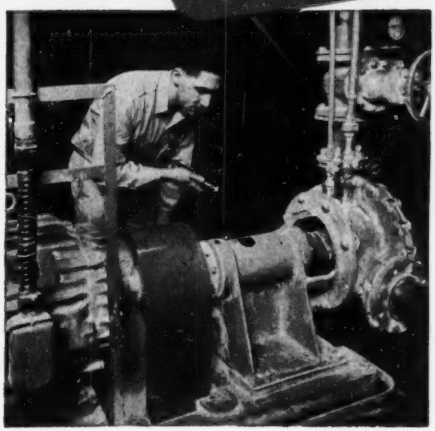
a name worth remembering when you want the best

SCALES • DIESEL LOCOMOTIVES • ELECTRICAL MACHINERY • PUMPS • HOME WATER SERVICE EQUIPMENT • RAIL CARS • FARM MACHINERY • MAGNETOS

No Leakage Here!

Equiseal
stuffing box stops all leakage on suction heads up to 15 feet

ALLIS-CHALMERS PROCESS PUMPS



IF YOU MUST STOP LEAKAGE because of sanitation or corrosion . . . or if abrasives in the stuffing box make it hard to keep a packing in your process pump . . . you need an Allis-Chalmers Type PD Process Pump with *Equiseal* stuffing box. Within its range, the *Equiseal* stuffing box keeps the pumped liquid entirely out of the packing. The liquid cannot leak out while the pump is running, even if the packing is removed. Abrasives cannot enter the stuffing box to ruin the packing.

HOW IT WORKS

The *Equiseal* stuffing box arrangement consists of an auxiliary impeller which produces a low pressure area in front of the stuffing box. At 1750 rpm, pressure on the pump side of the stuffing box is zero for suction heads up to fifteen feet and is reduced fifteen feet where the suction head is higher.

If you have leakage or excessive packing wear problems, you should know more about the Allis-Chalmers Type PD Process Pump equipped with the *Equiseal* stuffing box. To get complete information, call your Allis-Chalmers District Office or write Allis-Chalmers, Milwaukee 1, Wis., for Bulletin 08B6615.

A-3707

Equiseal is an Allis-Chalmers trademark.

ALLIS-CHALMERS

MIDWEST PREFABRICATED PIPING

SAVES LABOR

SAVES TIME

SAVES MONEY

SAVES TROUBLE

From A Simple Bend

Or Welded Assembly

To Complete Piping Systems For Power Plant

Or Process **Call On MIDWEST**

Midwest Shop-Fabricated Piping saves labor, time, money and trouble in erection. Subassemblies are always practical, with the difficult operations performed in the fabricating plant. Field welding is simplified as much as possible. All pieces are accurate in alignment and dimension . . . they are thoroughly cleaned to remove all scale and dirt . . . carefully inspected and tested . . . stress relieved when necessary . . . ready to erect quickly, easily at lowest cost. It is to your advantage to use Piping Prefabricated by Midwest.

MIDWEST PIPING SERVICE IS NATION-WIDE

4 Plants Are Better Than 1

PIPING FABRICATORS AND CONTRACTORS

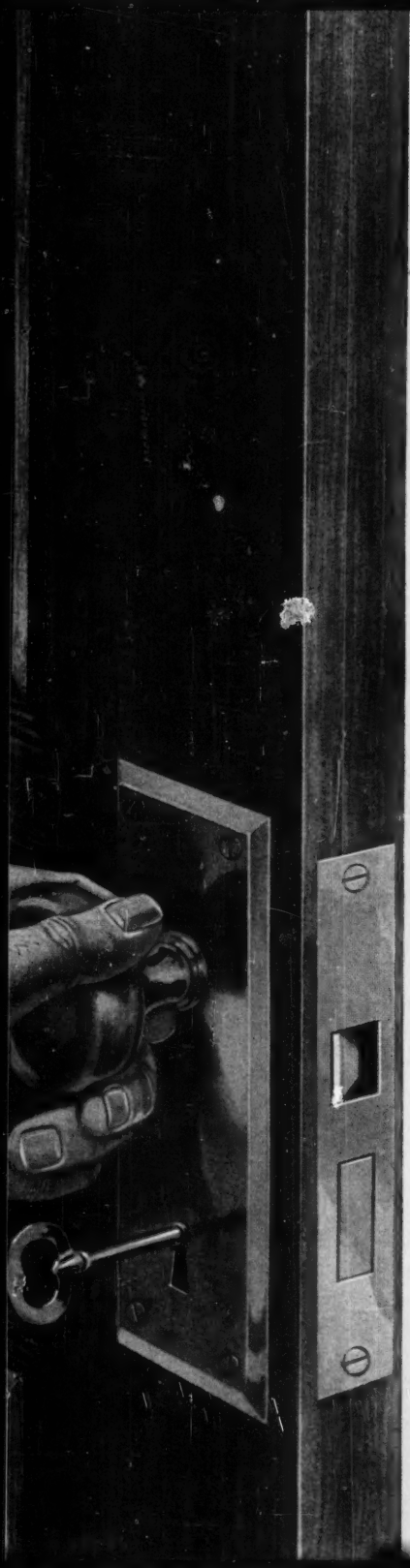
MIDWEST PIPING & SUPPLY CO., INC.

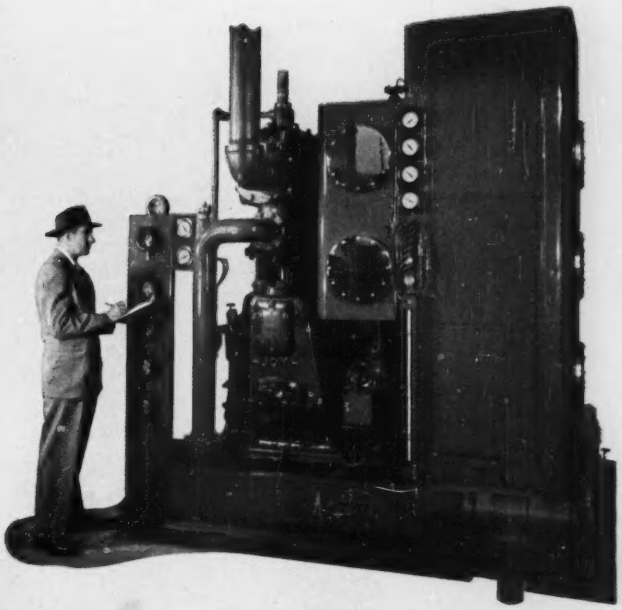
Main Office: 1450 South Second Street, St. Louis 4, Mo.

Plants: St. Louis, Passaic, Los Angeles and Boston

Sales Offices: New York 7—50 Church St. • Chicago 3—79 West Monroe St.
Los Angeles 33—320 Anderson St. • Houston 2—1213 Capitol Ave.
Tulsa 3—224 Wright Bldg. • Boston 27—426 First St.

4587





NOW!

JOY unlocks the door to CHEAP OXYGEN

A world's *first*—the Joy high-purity Oxygen Generator is based on entirely new principles, with exclusive advantages. It's compact, inherently safe and completely automatic—as easy to run as an air compressor. Uses no corrosive chemicals, operates at low pressure.

You don't buy compressed air in bottles; you buy your own air compressor. On the same reasoning, *buy a Joy Oxygen Generator;* make your own high-purity oxygen at a cost so low you never thought it possible. ● Different sizes for different users . . . tell us *your* requirements. *Joy Manufacturing Company, Oliver Bldg., Pittsburgh 22, Pa.*

JOY

SPECIALISTS IN THE COMPRESSION AND MOVEMENT OF AIR AND GASES SINCE 1885

...*when you LEAD them*, that's game in the BAG

You have to shoot *ahead* of fast-moving game, if you want to take home something for dinner. Same with business. Now's the time to plan for the day when you can get all the materials you want, with allocations gone, orders maybe not so plentiful, and competition red-hot. ● Allegheny Stainless Steel can work marvels in adding sales advantages to the products you make, or reducing operating costs in the equipment you use. Let our Development Engineers show you how.

Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.

AL
TIME-TESTED
STAINLESS STEEL

You can make it *BETTER* with

Allegheny Metal

WAD 4098 B

IF YOU USE ALLOY PIPING...

This New Bulletin Will Show You How KEY-KAST ALLOY WELDING FITTINGS Can Add Longer Life to Your Alloy Piping System—at Lower Cost. Send for Your Copy Today!

KEY-KAST ALLOY WELDING FITTINGS OFFER *ALL* THESE ADVANTAGES TO YOUR PIPING SYSTEM:

- Greater wall thickness throughout—for increased structural strength.
- Extra thickness in critical areas—for greater allowance against corrosion and erosion.
- Lower unit cost.
- Meets A.S.M.E., A.S.T.M., and A.S.A. codes.
- Bosses provided on all fittings for tapped openings.
- Controlled quality . . . through rigid metallurgical control—produced, inspected and tested in one plant.

AVAILABLE IN ALL SHAPES . . . SIZES . . . SCHEDULES . . . IN LOW AND INTERMEDIATE ALLOYS AND VARIOUS STAINLESS STEELS

Key company

Since 1916 . . . manufacturers and developers of products for high temperatures and pressure.

P. O. BOX
EAST ST. LOUIS, ILLINOIS

DISTRICT OFFICES: NEW YORK • CLEVELAND CHICAGO • TULSA • HOUSTON • LOS ANGELES

Mail this coupon today!

KEY COMPANY
P. O. Box 494-B East St. Louis, Illinois

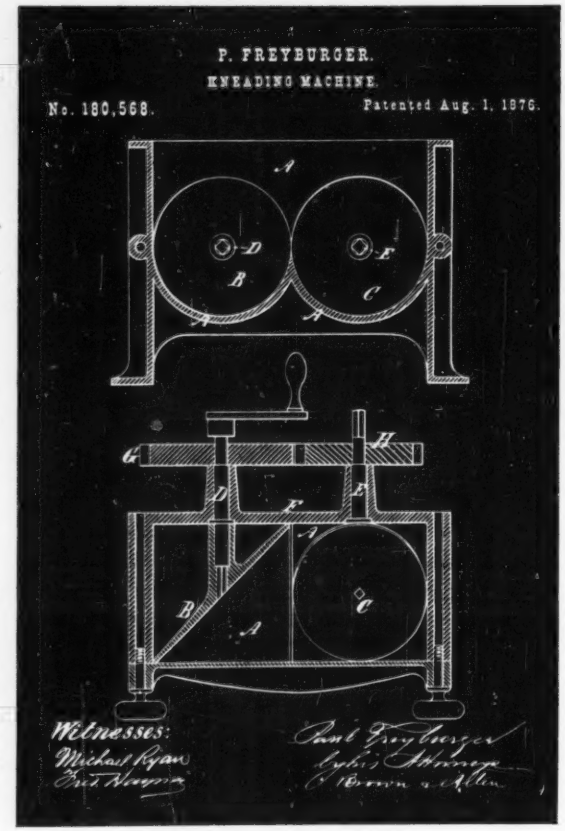
Please send me your new Key-Kast Alloy Welding Fitting Bulletin.

Name.....
Company.....
Position.....
Address.....
City.....Zone....State.....

75 YEARS AGO

this BAKER PERKINS patent* introduced a new era of mixing efficiency to the chemical processing industry

This machine, patented in 1876, was the first practical step towards efficient mixing and kneading operations in the chemical processing industry. It was the forerunner of the BAKER PERKINS mixing equipment, that has helped make the continued growth and expansion of that industry possible. Through constant research, BAKER PERKINS has maintained its lead in the development of machinery for nearly every type of heavy duty mixing operation. Today, BAKER PERKINS Mixers are highly regarded not only in the chemical processing field but in such widely diversified industries as foundries, bakeries, rubber, paint, plastics and rayon. BAKER PERKINS Laboratory Mixers help the research chemist and engineer in making pilot plant studies. B-P ter Meer Centrifugals fill the need for fast, efficient centrifugation. And B-P List system Ko-Kneaders at last make continuous mixing and kneading a practical operation. For complete information about BAKER PERKINS mixing equipment for the chemical processing industry, consult a B-P sales engineer or write us today.



* The first double blade mixing and kneading machine, invented by Paul Freyburger in 1876 for the Werner Pfleiderer Company, which later became part of BAKER PERKINS INC.

x31

BAKER PERKINS INC.

CHEMICAL MACHINERY DIVISION • SAGINAW, MICHIGAN

What do you want in a drive

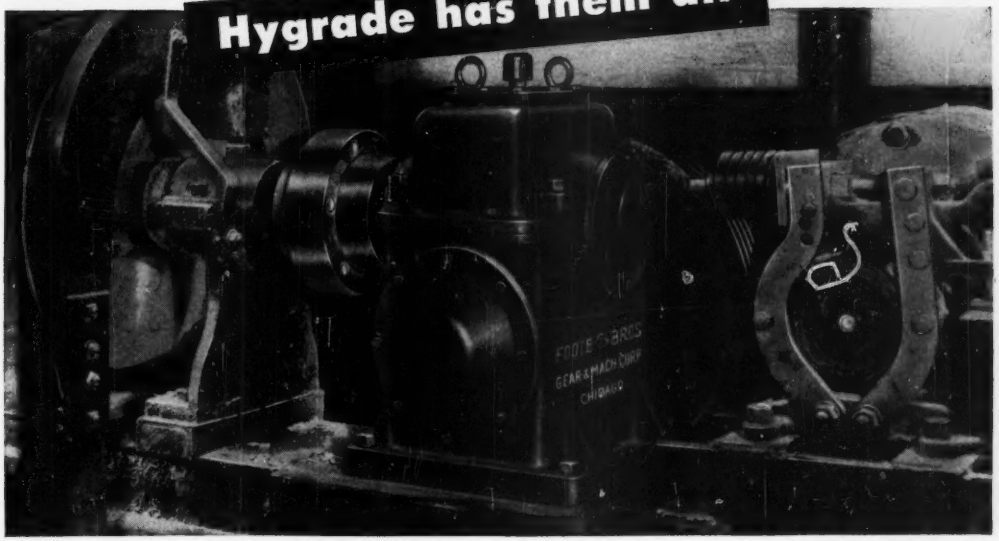
RUGGED STRENGTH

TROUBLE-FREE OPERATION

COMPACTNESS • ECONOMY

PRECISION ENGINEERING

Hygrade has them all



Engineered for those tough jobs in your plant where heavy duty demands rugged strength — ideal for any job where reliability, compactness, economy in operation are desired.

Foote Bros. Hygrade Drives are available in horizontal and vertical designs in a wide range of ratios up to 4108 to 1 — higher when required.

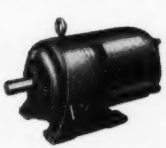
Hygrade Hytop Drives have wider, low-speed bearing span to accommodate long, unsupported vertical output shaft extensions, either upward, downward, or both. Advanced engineering, improved design, new techniques in manufacture, better control of material all make Foote Bros. Hygrade Drives ideal for your plant. Mail the coupon for Bulletin HGB.

FOOTE BROS. GEAR AND MACHINE CORPORATION
4545 South Western Boulevard • Chicago 9, Illinois

FOOTE BROS.

Better Power Transmission Through Better Gears

Line-O-Power Drives



Foote Bros.-Louis Allis Gearmotors

Maxi-Power Drives

FOOTE BROS. HYGRADE DRIVE
Installed on the manlift in International Milling Co. Plant at Detroit, Michigan.

Foote Bros. Gear and Machine Corporation
Dept. CE, 4545 S. Western Boulevard
Chicago 9, Illinois

Please send me a copy of Bulletin HGB on Foote Bros. Hygrade Drives.

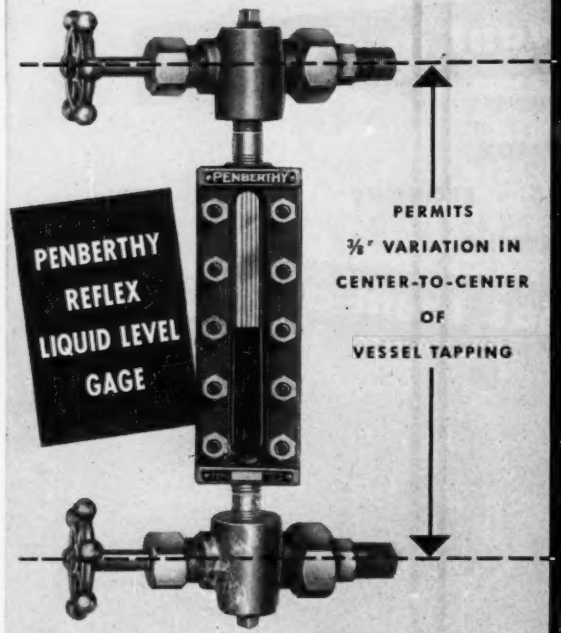
Name.....

Company.....

Address.....

Position.....

City..... State.....



PATENT APPLIED FOR

Another PENBERTHY First

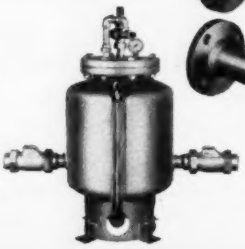
PENBERTHY "Floating Shank" *Saves Time and Money* in Gage Installation

A feature available only on Penberthy drop forged steel (and alloy) gage valves, the "floating shank" automatically compensates for as much as 3/8" variation in the center-to-center distance of the vessel tapping. This saves time and cuts the cost of gage installation . . . eliminates stresses often induced during mounting. Penberthy "floating shank" is available at slight additional cost. It will pay you well to specify "floating shank" on your next gage order.

OTHER PENBERTHY PRODUCTS

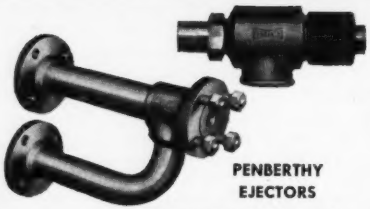
PENBERTHY TRANSPARENT GAGE

Used to observe color and density of liquids under high pressures and/or temperatures. Exceptionally sturdy construction—liquid chamber machined from solid block of metal. Ask for Catalog 35.



PENBERTHY CYCLING JET PUMPS

Automatically operated by air, gas or steam pressure . . . Will pump without clogging any liquid that will flow through pipes. Ask for Bulletin 5030.



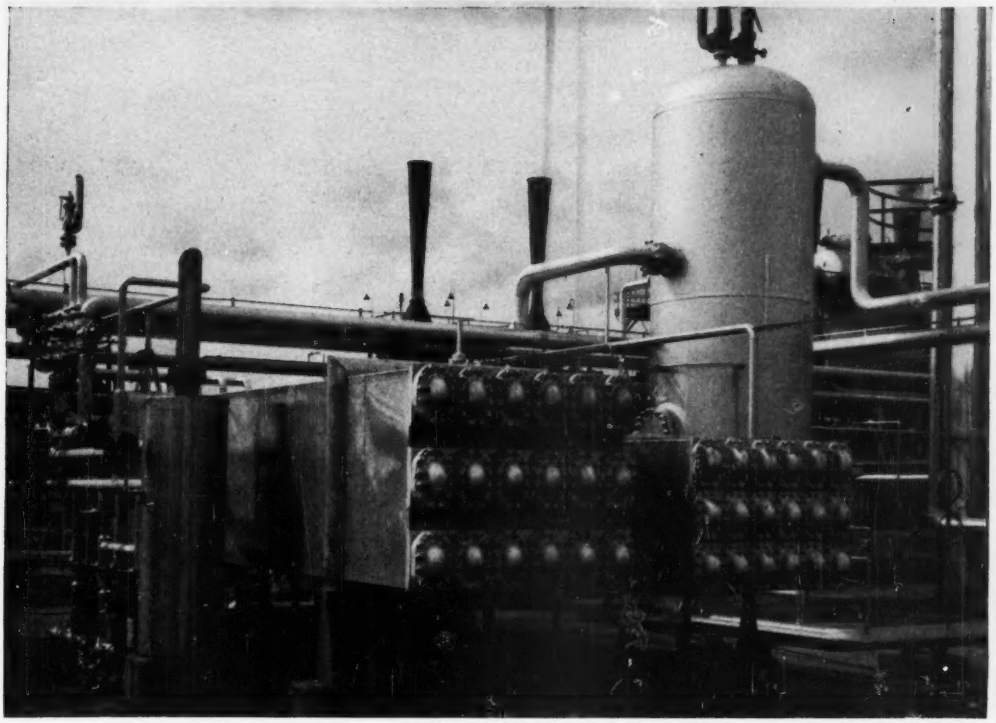
PENBERTHY EJECTORS

A simple jet pump operated by air, water or steam. Needs no lubrication . . . will not get out of order. Made in wide variety of materials and special units developed to meet unusual conditions. Ask for Bulletin 512.

4671

PENBERTHY INJECTOR COMPANY
DIVISION OF THE BUFFALO-ECLIPSE CORPORATION
DETROIT 2, MICHIGAN

Established 1886 — *Canadian Plant, Windsor, Ontario*



Designed by Delta Engineering Corporation, Houston. Insulation Contractor: Thermal Products Company, Houston.

Here's the last word in *lasting* insulation for this modern gasoline plant

● Inside those smooth aluminum jackets, you'll find the last word in modern, long-life insulation. Rigid blocks of all-glass FOAMGLAS prevent heat loss on vessels and heat-exchangers at this new gasoline plant operated by J. S. Abercrombie Company for the Old Ocean Unit.

They picked FOAMGLAS because it was expected to outlast any other insulation. Even without a protective coating of any kind, FOAMGLAS will not absorb water. It will not transmit vapor. Therefore the insulation value of FOAMGLAS remains constant over the years.

Every block of FOAMGLAS is a single piece of true inorganic glass containing millions of tiny air bubbles . . . there are no sealers or binders of any kind. FOAMGLAS is *all-glass;* that's why it has such phenomenal resistance to moisture and chemical attack. You can get FOAMGLAS in different sizes to meet your industrial insulation needs.

Send the coupon for free sample of FOAMGLAS and copy of our latest booklet.

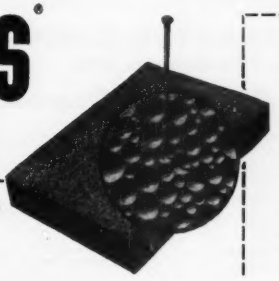
PITTSBURGH CORNING CORPORATION • PITTSBURGH 22, PA.

PITTSBURGH PC CORNING

FOAMGLAS®

the cellular glass insulation

The *best* glass insulation is cellular glass. The only cellular glass insulation is FOAMGLAS. This unique material is composed of still air, sealed in minute glass cells. It is light weight, incombustible, verminproof. It has unusually high resistance to moisture, chemicals and many other elements that cause insulation to deteriorate.



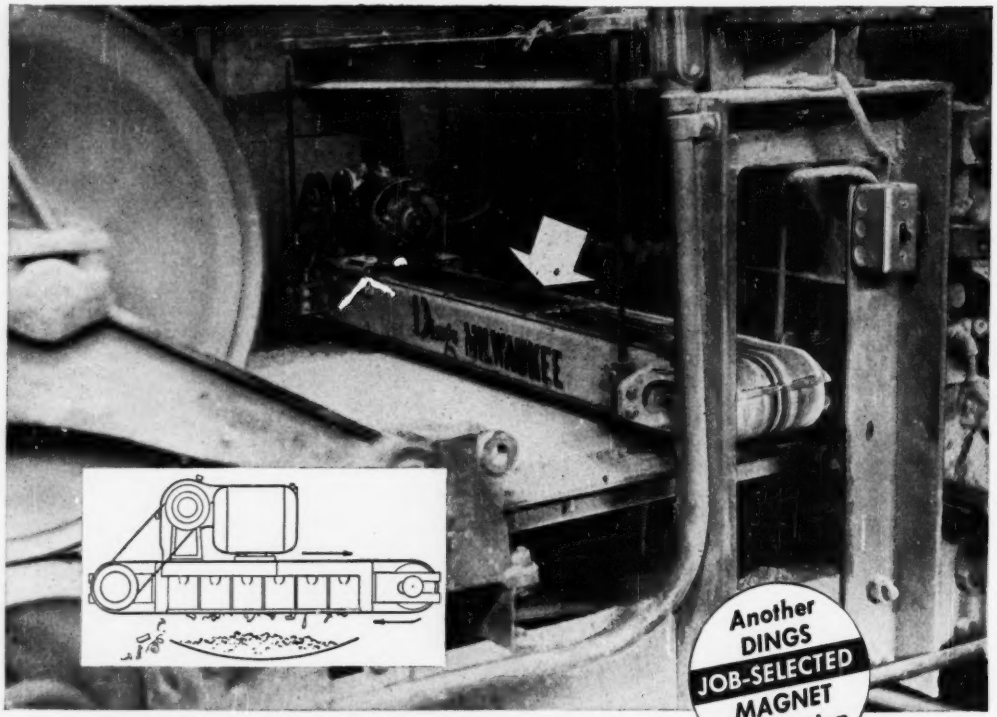
Pittsburgh Corning Corporation
Dept. CC-72, 307 Fourth Avenue
Pittsburgh 22, Pa.

Please send me, without obligation, a sample of FOAMGLAS and your FREE booklet on the use of FOAMGLAS for Piping and Process Equipment.

Name.....

Address.....

City.....State.....



ASBESTOS MINUS IRON EQUALS SALES GOLD

DINGS MAGNETS DO THE SUBTRACTING

HOMEOWNERS like the superior quality of asbestos shingles but if the shingles don't look like wood, they won't buy, says one of the biggest manufacturers of asbestos building materials in the business. So the shingles are passed through engraving rolls to give them the textured appearance of wood. A problem raised by this process and solved by a Dings self-cleaning non-electric Perma-Plate magnet (big illustration) is TRAMP IRON—nuts, bolts, wires, etc. which get in the asbestos during previous processing. This iron would wreck the rolls, alter the pattern and eventually cause rust spots in the installed material. The Perma-Plate gets it all out—automatically.

WHY was the Perma-Plate selected for this job over all other types and styles of magnets in the Dings line? *The specific application dictated its choice.* The magnet was "job selected." Whatever YOUR tramp iron problem, buy a Dings job selected magnet and KNOW it will be successful.

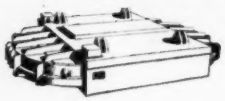
DINGS MAGNETIC SEPARATOR COMPANY
4731 W. Electric Ave., Milwaukee 46, Wis.

THE PERMA-PLATE (shown here without self-cleaning attachment) is non-electric, permanently magnetic. This magnet is particularly effective where the burden depth does not exceed 3".

THIS CATALOG HELPS YOU TO "JOB SELECT" A MAGNET

Is the material you want de-ironed a solid . . . semi-solid . . . liquid? Is it carried in chutes . . . ducts . . . conveyor belts? Catalog 5000-B lists Dings complete line by application, describes all Dings magnets from the low cost, non-electric "Perma" Plate magnet to the most powerful magnetic separators known. Send for it today.

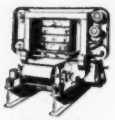
DINGS MAGNETS

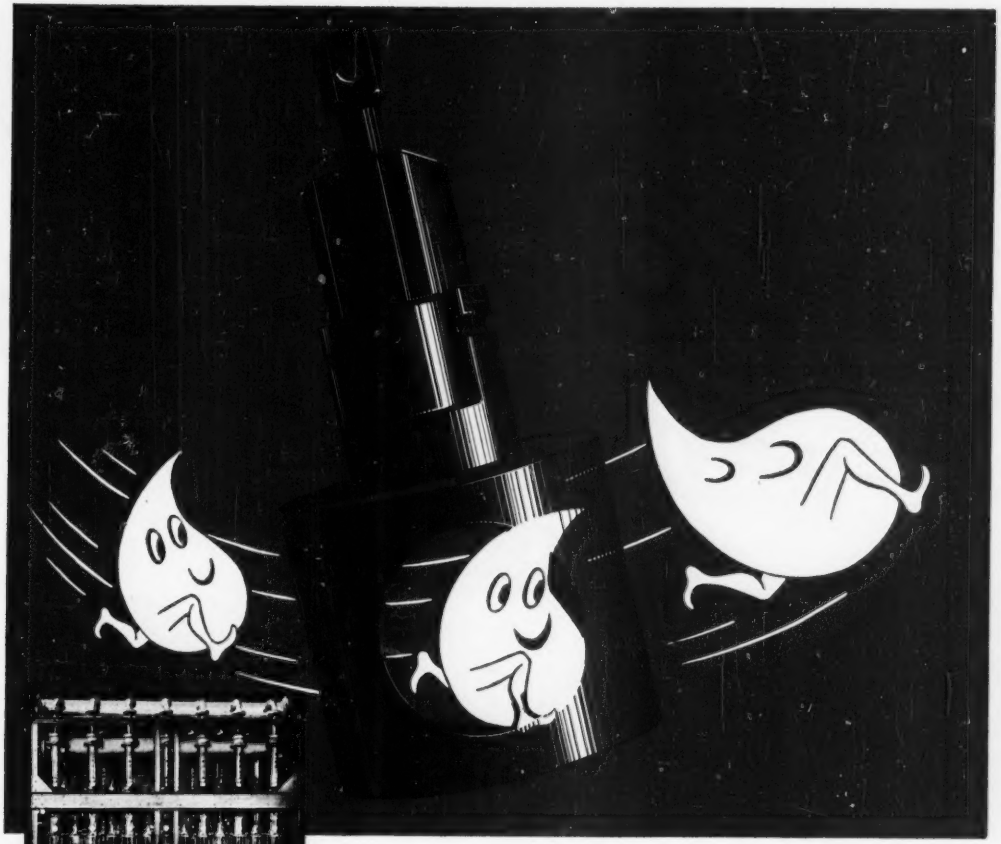

Rectangular

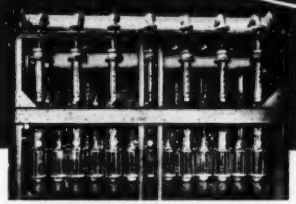
High Intensity Induced Roll

Non-Electric and Electric Pulleys

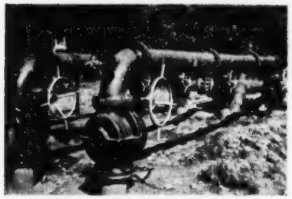
Non-Electric Drums


High Intensity Type EBK Crossbelt

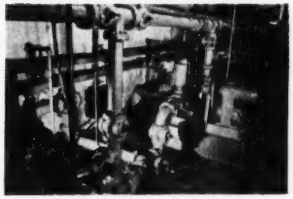




IN CHEMICAL PLANTS a.c.f. Round Port Valves provide quick emptying, full protection against corrosive action.



IN THE PETROLEUM AND GAS INDUSTRY a.c.f. Round Port Plug Valves provide full-area flow with fast shut-off.



IN SEWAGE PLANTS a.c.f. Valves offer uninterrupted flow. CYLINDRICAL plug actually shears obstructions.

100% OBSTRUCTION FREE

The passage of an a.c.f. Round Port Lubricated Plug Valve exactly conforms to the size and shape of the pipe. Ideal for capacity flow of abrasives and suspensions, these valves have the same quick, quarter-turn shut-off feature of rectangular port a.c.f. CYLINDRICAL "Full Pipe Area" Plug Valves. In addition, an a.c.f. Valve cannot wedge in its seat. Why tolerate a less efficient valve?

a.c.f. CYLINDRICAL FULL PIPE AREA PLUG VALVES

Write for Catalogue 4-CM, American Car and Foundry Co., Valve Division, 1501 E. Ferry Ave., Detroit 11, Mich.

Representatives in 50 Principal Cities

Congratulations

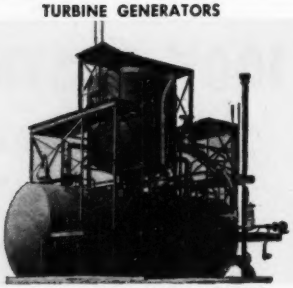
...to one fifty-year

TUBE CLEANERS

TURBINE GENERATORS

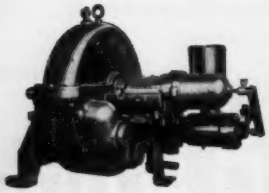
SYNCHRONONOUS MOTORS & GENERATORS

STEAM JET EJECTORS

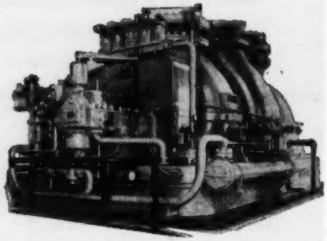


DEAERATING FEEDWATER HEATERS

TURBOCHARGERS FOR DIESELS



MECHANICAL DRIVE TURBINES



CENTRIFUGAL BLOWERS

EXPLOSION-PROOF MOTORS

ELLIOTT COMPANY

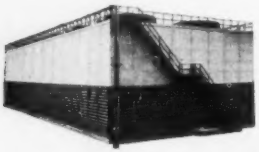
starting in 1901—just over the half century—has kept pace with the chemical process industry . . . Beginning as a manufacturer of tube cleaners, which became oil refinery favorites when pressure stills entered the picture, Elliott engineers rapidly added steam turbines for mechanical drive, centrifugal blowers, steam jet air ejectors now widely used in vacuum process work, electric motors, large and small, with emphasis on dependable service under difficult conditions, and in fact an ever-expanding line of steam, electric and process equipment as illustrated at the left. Many of these products have played a strong part in process developments.

Looking ahead, Elliott Company will continue to plan and improve its full line of equipment. Continual engineering development work assures you of being "A Step Ahead With Elliott."

ELLIOTT Company

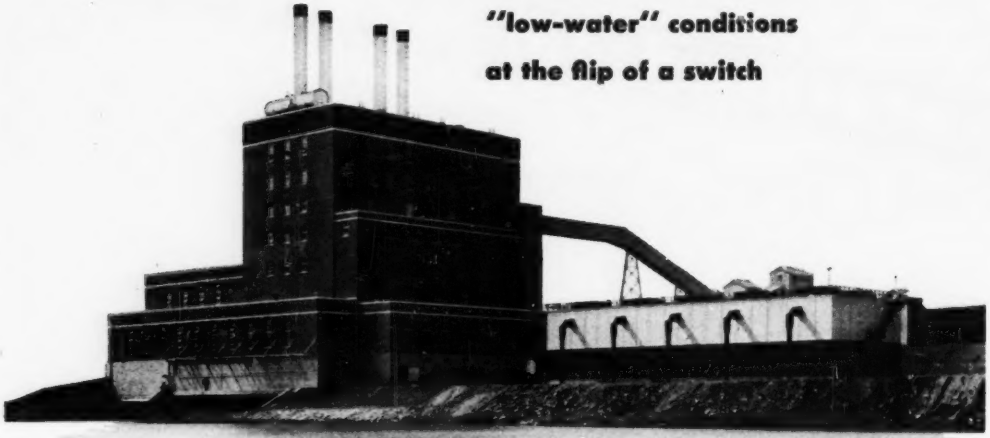
Q2-7 **JEANNETTE, PA.**

Plants at: JEANNETTE, PA. • RIDGWAY, PA.
AMPERE, N. J. • SPRINGFIELD, O. • NEWARK, N. J.
DISTRICT OFFICES IN PRINCIPAL CITIES



a standby for nature

—ready to meet "low-water" conditions at the flip of a switch



This new, ten-cell Foster Wheeler cooling tower was installed by a major southern power company for the sole purpose of meeting their cooling needs when the water level of the river drops too low.

Sheathed with fire-proof asbestos board, this installation cools 50,000 gallons per minute from 114° to 91° F with a spray and evaporation loss of less than 2.5%.

For power generation, oil refining or chemical production—year-round or intermittent operation—there's a Foster Wheeler cooling tower to meet your particular requirements. Each tower is engineered and constructed to give you maximum performance at minimum cost.

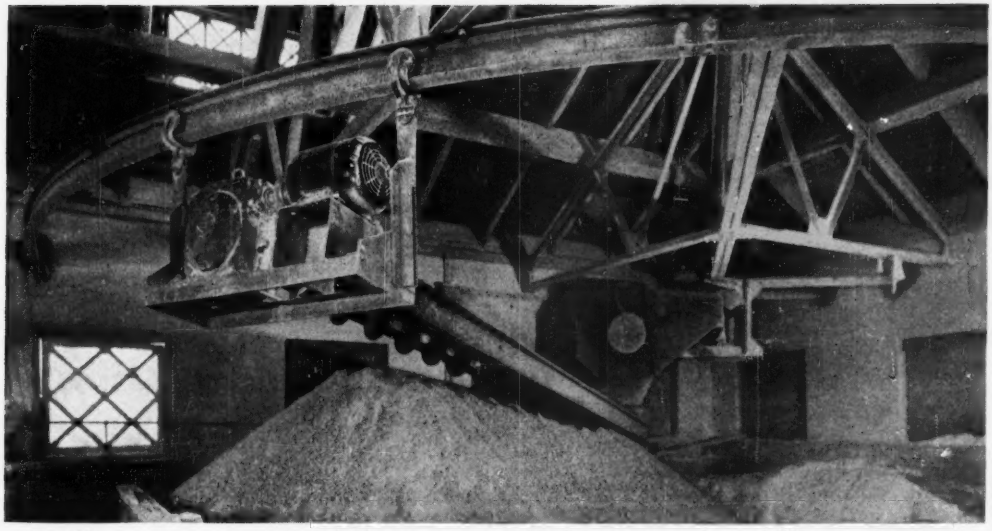
Get the whole story...

Send for this new, well-illustrated catalog today. Includes helpful information on tower design for freezing climates, effects of recirculation and surroundings on performance, in addition to complete description of sound construction and high-quality materials to which Foster Wheeler customers have long been accustomed.

A data sheet is bound into the catalog to aid you in writing the specifications for the cooling tower which will best meet your needs. Write for Catalog CT-52-4 to:

FOSTER WHEELER CORPORATION
165 BROADWAY, NEW YORK 6, N. Y.

FOSTER WHEELER



Chemical storage system using rotating Link-Belt screw conveyor, 19-ft. radius, with outer end suspended by trolleys from curved track. Link-Belt Bulk-Flo conveyor-elevators carry material from railroad track hoppers to hopper above pivot point of screw conveyor.

There's no substitute for "total engineering" in screw conveyors

LINK-BELT integrates all components to give you the right screw conveyor for your job

HERE's how "total engineering" works for you when you buy Link-Belt Screw Conveyors.

First, conveying specialists analyze your problem. Then, Link-Belt's vast experience in design and manufacture is at your command to recommend the screw conveyor—or system of conveyors—for your particular requirements. The right components are then selected from Link-Belt's complete range of types and sizes.

Link-Belt "total engineering" on your screw conveyors is your assurance of efficient design . . . balanced performance.

To benefit from Link-Belt's materials handling experience and engineering service, contact the Link-Belt office near you.

LINK-BELT designs and builds all components

SCREWS—Link-Belt makes a complete range of conveyor screws—Helicoid, Sectional Flight, Cut Flight, Ribbon Flight, Paddle type and other special types for such diverse applications as feeding, conveying, mixing, agitating, stirring, blending, etc.

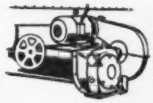
HANGERS—Available in a variety of styles and mountings, with various bearing materials and steel or cast hanger frames.

TROUGHS—Link-Belt builds flanged, angle flanged, flared, rectangular, dust-seal, jacketed and drop-bottom types in steel or alloy metals. Variety of connections, supports, covers and clamps offers added design flexibility.

SPOUTS & GATES—Plain discharge spouts can be fixed or detachable. Discharge gates, flat or curved slide, can be hand or rack-and-pinion operated.

SHAFTS & COUPLINGS — Conveyor couplings and end shafts are designed for adequate torsional strength and have jig-drilled coupling bolt holes for accurate alignment.

TROUGH ENDS—Steel or alloy metal plate or cast trough ends to match all trough shapes, provide required shaft bearing support and alignment. Seal glands to protect bearings, if required.

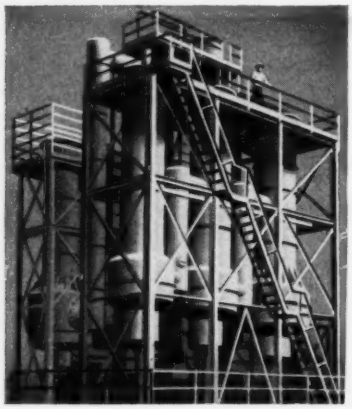


DRIVES — Link-Belt designs and builds many forms of drives to suit specific conditions—Enclosed gear, Electrofluid, P.I.V. variable speed, and chain drives of various types.

LINK-BELT

SCREW CONVEYORS 12,084-A

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in Principal Cities.



What do we know about chemical solutions?

Well, there's *one* we know a good deal about. That's the solution to your concentrator problem.

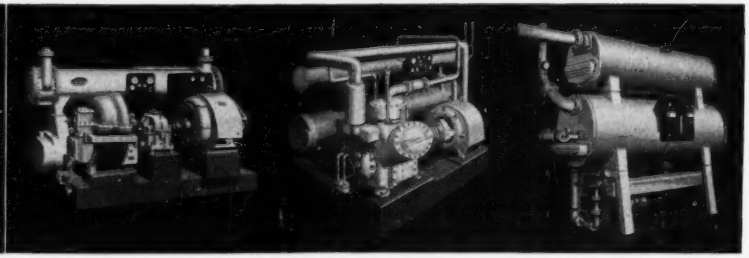
If you're going into concentrates, we think we have a lot of background you could use. Low temperature applications, or high . . . batch or continuous operations . . . single or multiple effects — we've worked with them all. We're set up to tailor your installation for just about anything you have in mind . . . for processes where scale might be built up . . . where there'd be salting out . . . where heavy, viscous materials would have to be handled . . . where an especially unstable chemical would be involved. . . .

Even though your own application might be different from anyone else's, it's bound to benefit from our combined experience in evaporator design, refrigeration and heat transfer.

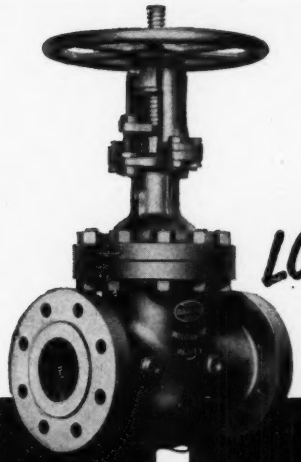
Wouldn't you like to know more about the Carrier Concentrator and its various types? Just write Carrier Corporation, Syracuse, New York.

Carrier

AIR CONDITIONING
REFRIGERATION
INDUSTRIAL EQUIPMENT

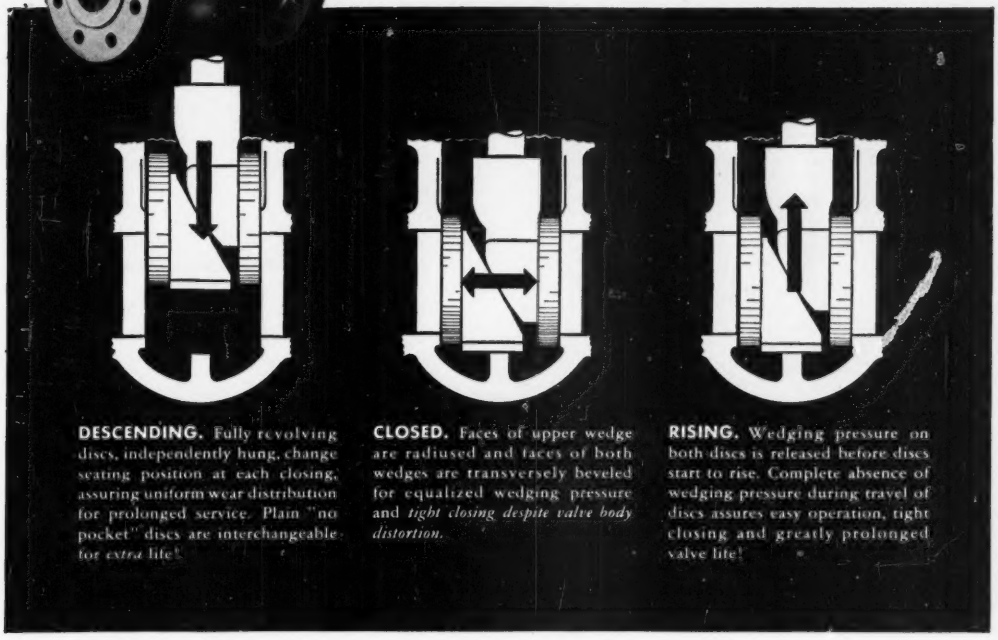


We've got the solution for the *refrigeration* side of your Carrier Concentrator installation, too. Only Carrier gives you this choice: for motor, turbine, gas engine or Diesel drive, the Carrier Centrifugal Refrigerating Machine *(left)*, or the Carrier packaged Reciprocating Refrigerating Machine *(center)*; for high or low pressure steam, the Carrier Absorption Refrigerating Machine *(right)*.



Look how you gain LONGER, TROUBLE-FREE VALVE LIFE

with Darling revolving disc gate valves*



DESCENDING. Fully revolving discs, independently hung, change seating position at each closing, assuring uniform wear distribution for prolonged service. Plain "no pocket" discs are interchangeable for *extra* life!

CLOSED. Faces of upper wedge are radiused and faces of both wedges are transversely beveled for equalized wedging pressure and *tight closing despite valve body distortion.*

RISING. Wedging pressure on both discs is released before discs start to rise. Complete absence of wedging pressure during travel of discs assures easy operation, tight closing and greatly prolonged valve life!

***DARLING REVOLVING DISC GATE VALVES FOR EVERY NEED . . .**

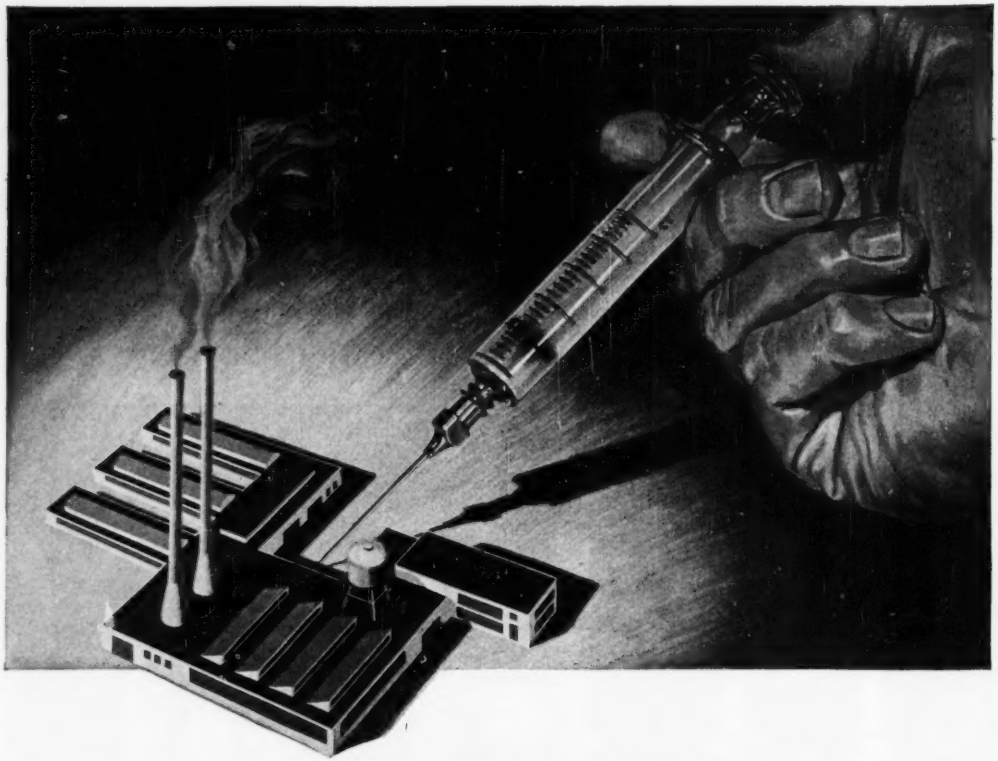
These unique valves are available in iron, bronze, steel, special corrosion-resistant alloys and combinations, and in a broad range of sizes, for all kinds of normal and unusual services in pressures up to 1500 pounds. Before you buy gate valves of *any* type, find out what you stand to gain by using the proper Darling valves. Simply outline your service requirements and ask for a free, descriptive bulletin.

DARLING VALVE & MANUFACTURING CO.

Williamsport 3, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario.

FOR PLUS VALUES, JOB-PROVED AGAIN AND AGAIN



Vitamins That Make Production Grow

Perhaps, like many producers these days, you've found today's heavier demands are asking more from your equipment than it can produce.

Consider how one typical company injected new productivity into *its* operation:

This was a soap processor who needed extra production and new fuel economy for a process involving crude with a high salt content. Development of a specially-built still pot of economical clad steel eliminated need of multiple distillation . . . reduced fuel and maintenance . . . speeded up heating . . . ended corrosion . . . provided structural strength to withstand vacuum—*and cut first equipment cost, too.*

What makes this story significant is that it resulted from a progressive planning method followed by certain Equipment Builders.

These specialists bring leading engineers, designers, and materials suppliers into the planning of your equipment. Each factor affecting performance *is thought out by a specialist in that field.* And in such planning, you'll find these builders turning to Lukens for its knowledge of materials, as well as its wide range of low-cost clad steels.

Even with new equipment often difficult to get these days, we know builders who can recondition what you have for better performance, better profits. Write us today, explaining your need. Manager, Marketing Service, 400 Lukens Building, Coatesville, Pennsylvania.

LUKENS

Visit the Lukens Booth (#150) at the 7th National Chemical Exposition in Chicago—September 9 through 13.

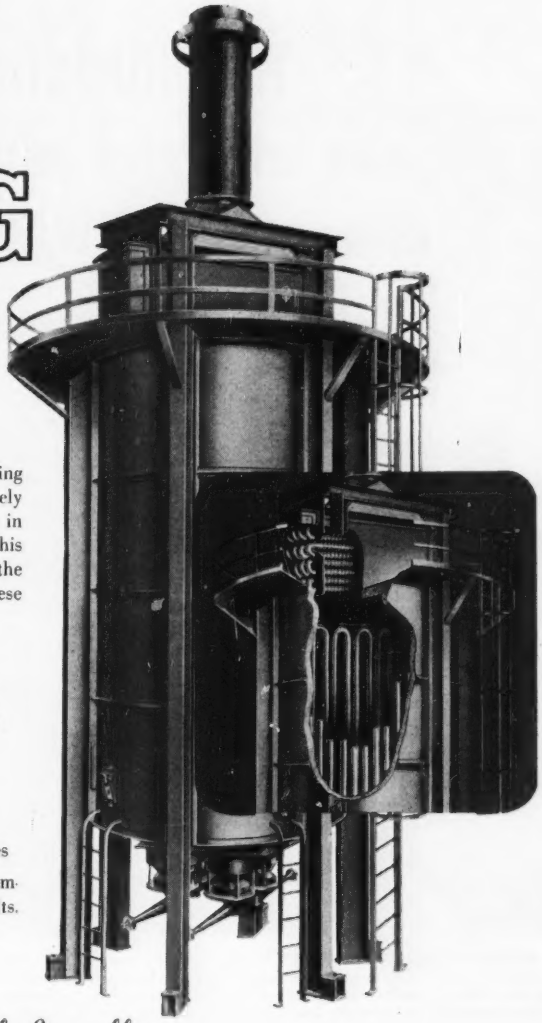
LUKENS STEEL COMPANY

WORLD'S LEADING PRODUCER OF SPECIALTY PLATE • PLATE SHAPES • HEADS • CLAD STEELS

STRUTHERS WELLS

FIRED HEATING EQUIPMENT

for Dowtherm and Other Fluids



The Struthers Wells forced circulation system utilizing Dowtherm as a heat transfer medium has been widely accepted by the chemical industry and other users in recent years. Scores of large installations in this country, and numerous units abroad, testify to the universal satisfaction of the user. Many of these installations are repeat orders.

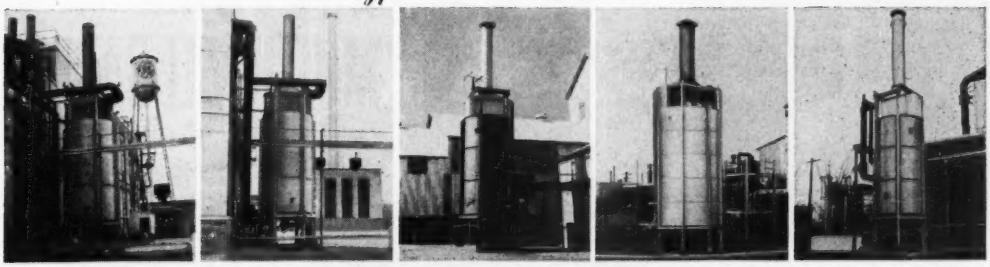
This system offers the user:

- Proven performance at maximum temperatures
- Trouble-free operation, no coking or overheating of equipment
- High thermal efficiencies
- Close temperature control
- Complete equipment and engineering service
- Moderate initial cost and low maintenance charges

We also supply equipment for heating gases to high temperatures—for superheating steam—heating asphalts, absorption oil and a wide range of services.

Good deliveries are available in standard sizes.

Typical Installations



Write for Bulletin B-45 on your letterhead, please

Struthers Wells

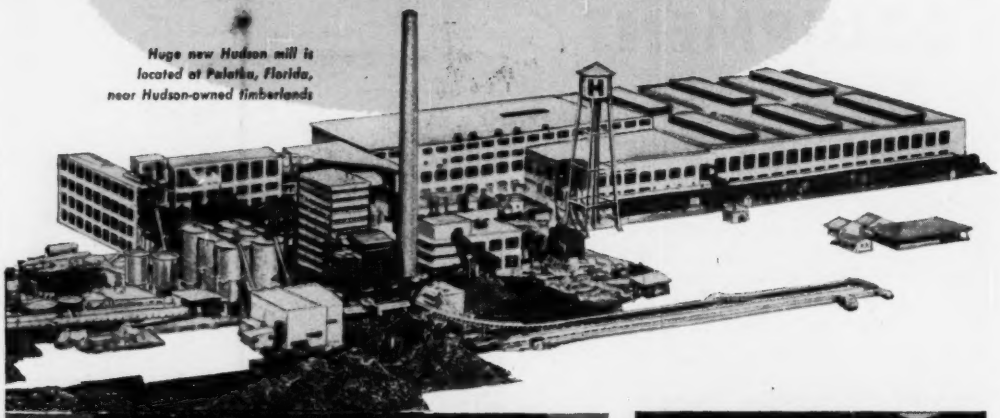
STRUTHERS WELLS CORPORATION

WARREN, PA.

Plants at Warren, Pa. • Titusville, Pa.

Offices in Principal Cities

How HUDSON'S new integrated mill benefits users of MULTIWALL SACKS



Huge new Hudson mill is located at Palatka, Florida, near Hudson-owned timberlands

1 INTEGRATION = ASSURED DELIVERY. Hudson's dispatch room can route your order for delivery by rail, truck, or water. Loading schedules are rigidly upheld, because Hudson uses no outside suppliers to create possible delays. Every step from tree to finished sack is under Hudson's exclusive ownership and control. And Hudson is big enough to be reliable.

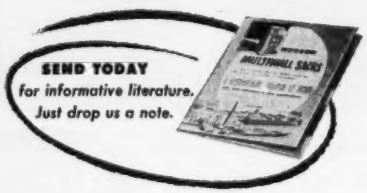
2 INTEGRATION = MORE UNIFORMITY. A single laboratory control is over every step of manufacture. Variations from outside suppliers are avoided. Tests ensure consistently high quality.

3 INTEGRATION = BETTER COST CONTROL. An overall management holds costs down. Hudson's brand new mill also has the finest multiwall equipment made, to pass on to you savings in the form of better performance, better service, and competitive prices.

HUDSON

MULTIWALL SACKS

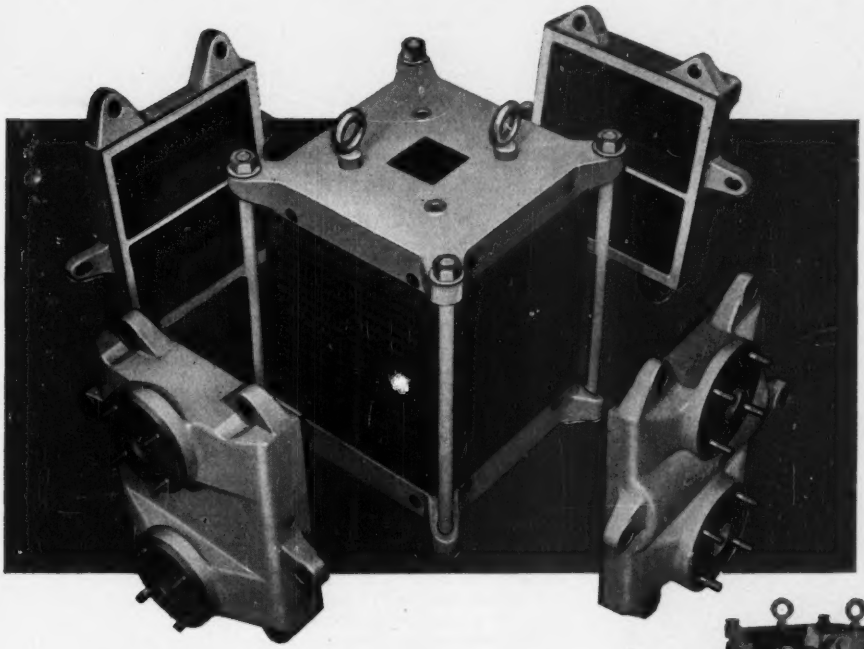
Pasted and sewn—valve and open mouth

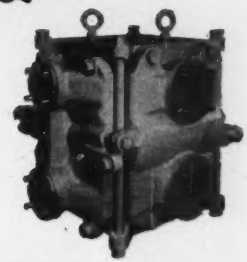


HUDSON PULP & PAPER CORPORATION Dept. 133, 505 Park Ave., New York 22

A *NEW* HEAT EXCHANGER

built for better service in chemical processing





"DELANIUM" GRAPHITE CUBIC EXCHANGERS

offer Pharmaceutical, Petroleum, Synthetic Textile and other processing plants these advantages . . .

● *Higher Pressures,* with operating range to 150 psi.

● *Reduced Maintenance.* Breakage-hazard in cleaning long tubes and handling fragile tube bundles eliminated by compact, rugged graphite cube. All graphite parts encased in metal.

● *Increased Utility.* All heads and blocks interchangeable. Flow may be varied by changing heads. Install unit horizontally or vertically as a liquid-to-liquid exchanger, evaporator or condenser. Basic units can be manifolded — in series for increased surface; or in parallel to assure continuous operation without shutdown during routine maintenance.

● *Adaptability.* Slotted unit design for gas coolers and partial condensers.

● *Compactness.* 50 sq. ft. of surface in the 15" cube.

Constructed of dense, impregnated graphite, the "Delanium" cube is outstanding for handling most corrosive materials.

Delanium's engineers are available to help you with your problems.

"Delanium"

Delanium Carbon Corporation
18 East 48th St., New York 17, N. Y.
In England: Powell Duffryn Carbon Products Ltd.
Hayes, Middlesex, England

Leading companies putting "Delanium" Exchangers to work

Stauffer

SINE HEYDEN

ROCHE

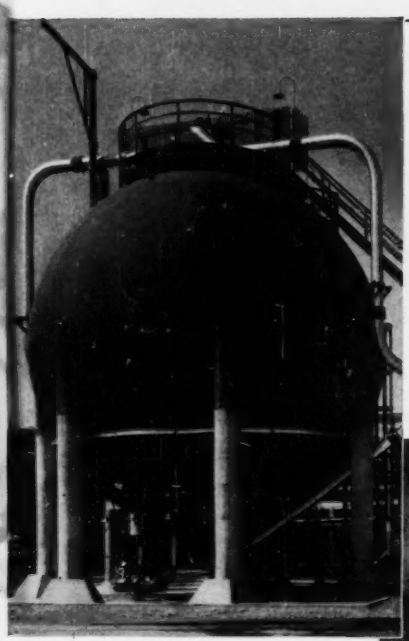
General Aniline & Film Corporation

Calco

Lederle

TESTED & PROVED

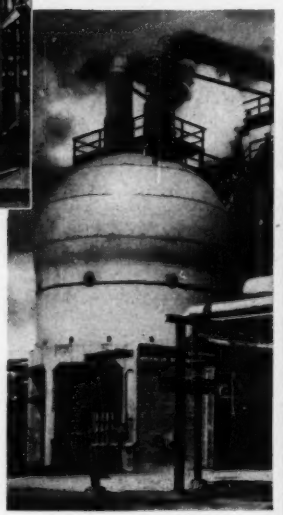
CHICAGO BRIDGE & STEEL PLATE



Over half a century of designing, fabricating and erecting steel plate structures has tested and proved Chicago Bridge & Iron Company's ability to serve the chemical-process industries. There are Horton storage tanks, absorber towers, desalting spheres, elevated water tanks, floating roof tanks, vacuum flashers, diffusers . . . to name just a few types we have built. Or your product may require pressure storage . . . or be of a corrosive nature. Whatever your requirements, we have complete facilities for building steel plate structures to fit your needs.

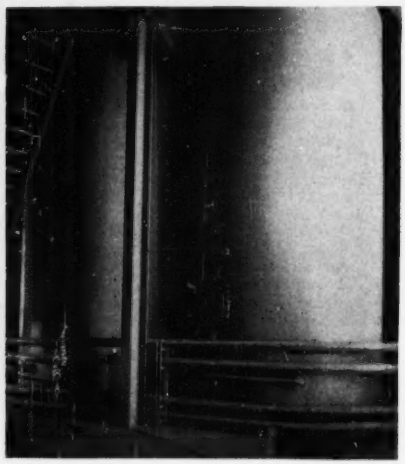
Take advantage of Chicago Bridge & Iron Company's 63 years of specialized knowledge and experience. Write our nearest office for complete information. There is no obligation on your part.

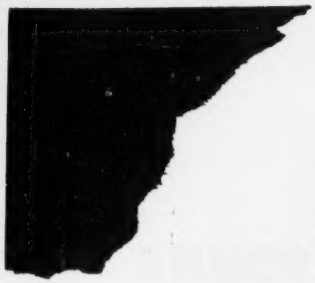
● *Above: 2,000-bbl. desalting Electrosphere, 28 ft. in diam. This desalting sphere was erected at the Pan-American Refining Corporation's Texas City, Texas refinery. Use as a desalter is just one special application of the versatile Hortonsphere.*



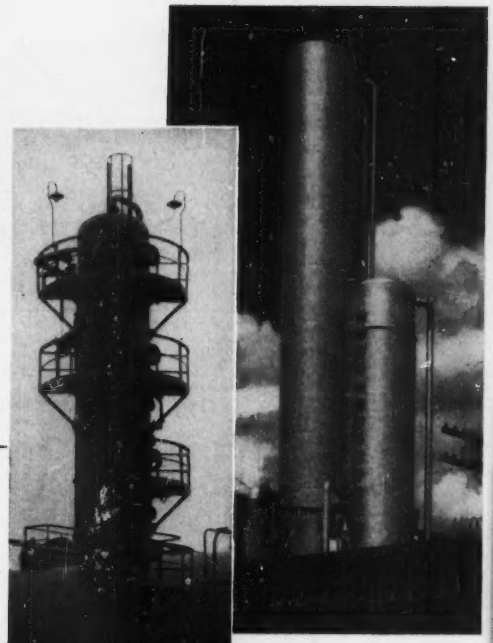
● *Right: Vacuum flasher unit built for the Shell Oil Company refinery at Wood River, Illinois. It is 30 ft. in diam. and fabricated of alloy steel clad. Its throughput of 34,000 bbls. per day furnishes feed to the refinery's twin fluid cracking units.*

● *Below: Two of six 14-ft. 6-in. diam. by 33-ft. 4-in. diffusers built by Chicago Bridge & Iron Company for a kraft mill in the south.*



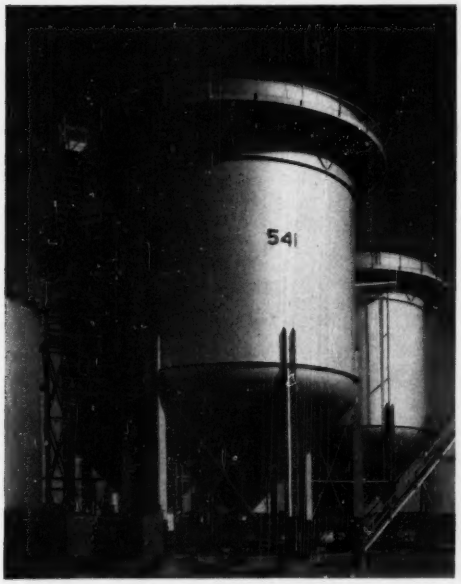


● *Right: A 6-ft. diam. by 40-ft. pierced plate caustic wash tower in the debutanizer and splitter unit of a large refinery in Louisiana. It was fabricated and erected by the Chicago Bridge & Iron Company.*



● *Above: A 12-ft. diam. by 100-ft. absorber tower built for the Liquid Carbonic Corporation at Urbana, Ohio. It is used to absorb the CO_2 from flue gas resulting from the burning of natural gas.*

IRON COMPANY STRUCTURES



● *Above: These special 4000-bbl. cone bottom silt aeration tanks were installed at a petroleum refinery in the south to separate oil from silt. Using river water for many purposes, the refinery found that silt in the water became impregnated with oil. These tanks aerate about 500 bbls. of silt per day and recover from 60 to 80 bbls. of oil from it.*

Congratulations to Chemical Engineering on its Golden Anniversary

Chicago Bridge & Iron Company wishes to pay tribute to Chemical Engineering on the occasion of its fiftieth anniversary . . . for faithful service to a profession we both have served this past half century.

CHICAGO BRIDGE & IRON COMPANY

Atlanta 3	2120 Healey Bldg.	Detroit 26	1503 Lafayette Bldg.	Philadelphia 3	1625—1709 Walnut St. Bldg.
Birmingham 1	1510 North Fiftieth St.	Havana	402 Aubrey Bldg.	San Francisco 4	1522—200 Bush St.
Boston 10	1005-201 Devonshire St.	Houston 2	2103 C & I Bldg.	Seattle 1	1305 Henry Bldg.
Chicago 4	2124 McCormick Bldg.	Los Angeles 17	1505 General Petroleum Bldg.	Tulsa 3	1623 Hunt Bldg.
Cleveland 15	2220 Guildhall Bldg.	New York 6	3318—165 Broadway Bldg.	Washington D. C.	1160 Cafritz Bldg.

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA

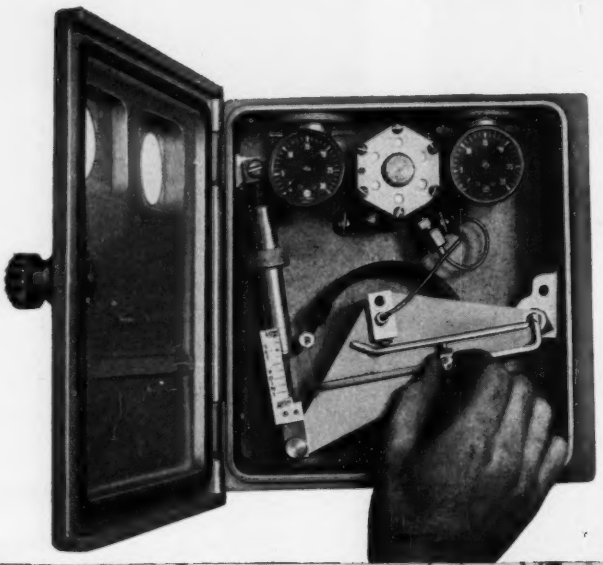
Here's the new

HONEYWELL PRESSURE

---

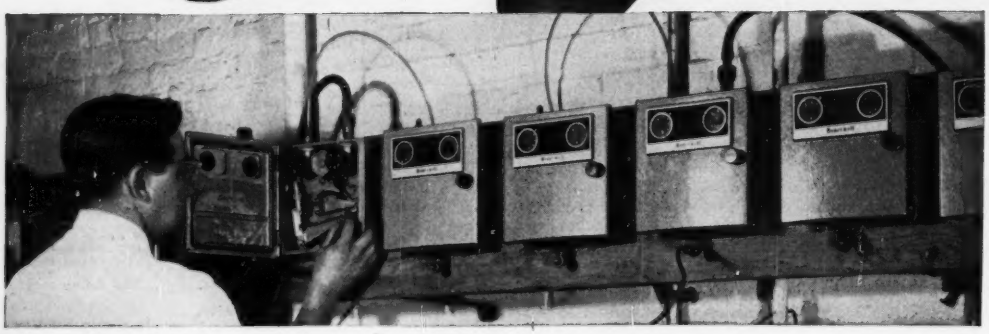
the **heavy-duty** controller

designed for accuracy at low cost

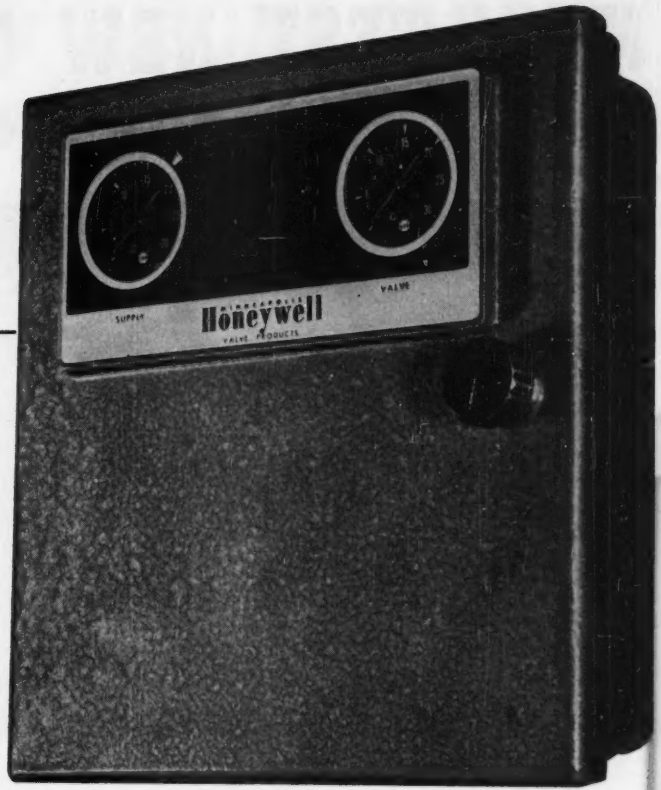


A look inside the Honeywell Pressure Pilot shows its simple design, rugged construction, and accessibility of all adjustments.

Every Pressure Pilot undergoes rigid inspection and testing before shipment.



PILOT



SPECIFICALLY designed for applications requiring accurate control where more expensive indicating or recording instruments are not warranted, the Honeywell Pressure Pilot is ideal for regulating pressure of separators, pump outlets, hydraulic systems, fluid transmission lines, cooling water lines, turbine oil, and furnace fuels.

The Pressure Pilot employs a Bourdon tube to detect line pressure changes . . . a flapper and nozzle assembly to provide a corresponding air signal pressure . . . and a pneumatic relay which amplifies the signal to position a diaphragm control valve.

Exceptional simplicity of design characterizes this new controller. Among its outstanding features are a convenient set point adjustment, unique overpressure safeguard, easy reversibility, and universal mounting.

For accurate control at low cost, for rugged construction, for dependable pressure control . . . your best buy is the Honeywell Pressure Pilot. Our local engineering representative will welcome the opportunity to give you a demonstration in your plant. Call him today . . . he is as near as your phone.

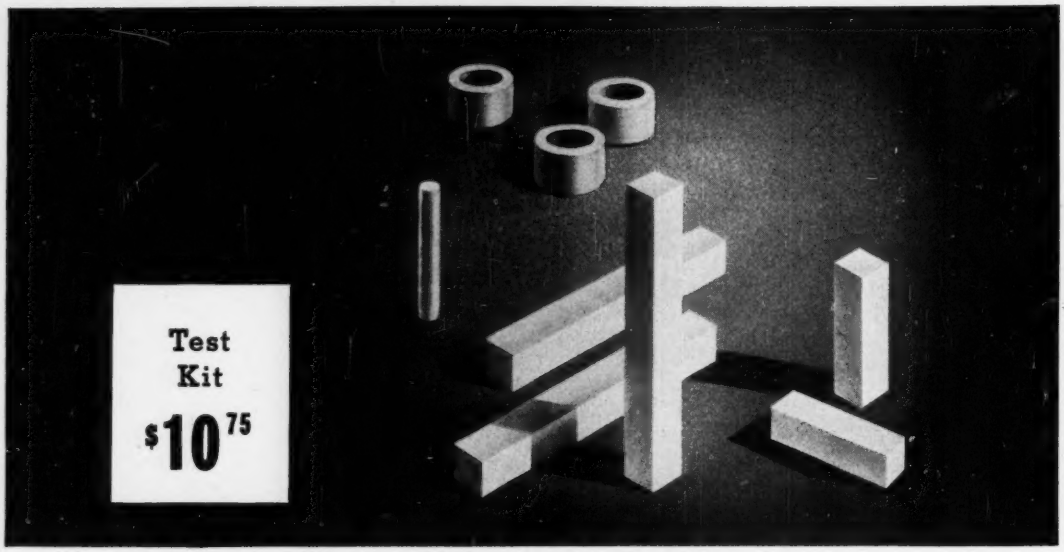
MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 1904 Windrim Ave., Philadelphia 44, Pa.

MINNEAPOLIS
Honeywell
VALVE PRODUCTS
First in Controls

● *Important Reference Data*

Write for new Bulletin 16-1, "Honeywell Pressure Pilot."

Now, TEST NEW CARBOLOY *for corrosion,*



FOR METALLURGISTS! ENGINEERS! PRODUCT DESIGNERS! Lab-test kit of new Grade 608 Carboloy Chrome Carbide. Includes: three bars ¼" square x 2"; two bars ¼" square x 1"; three bushings 5/16" long, ½" O.D., 5/16" I.D.; one rod ⅛" diameter x 1" long. (Bulletin WR-104 included.) Samples adequate for wide range of metallurgical and chemical tests. Additional information relative to your application free, on request, from Carboloy engineers. Order kit for your preliminary testing today. Check new Grade 608 Chrome Carbide against your requirements *now*. See properties and test results below:

Properties and test results of Grade 608

THE OUTSTANDING properties of Grade 608 Cemented Chrome Carbide promise to open new cost-saving applications throughout industry. You may wish to expedite your initial test appraisals by starting with the above test kit now, pending larger quantities or supplies as production facilities expand.

Physical Properties
(Grade 608)

Composition: 83% CR_3C_2
2% WC
15% Ni

Hardness (Nominal): 88 Rockwell "A"

Density (Nominal): 7.0 gms/cm³ (Slightly lighter than S.A.E. 1095 steel)

Transverse Rupture Strength: 100,000 P.S.I.

Coefficient of Thermal Expansion: 6.4 in range of 70° —1292°F.

Relative Abrasive Resistance: Dry Al Oxide—58.0

Test Results

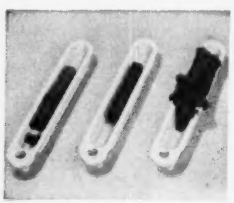
Salt spray. After subjection to a 30% salt spray for 750 hours, Grade 608 still retained its metallic lustre.

Sulphuric acid. With sulphuric acid as the corrosive agent, Grade 608 showed about 30 times the resistance of 18-8 stainless steel, and 3 times the resistance of tungsten carbides.

Nitric acid. Using nitric acid, the resistance to corrosion was approximately 8 times that of other carbides and twice that of stainless steel.

Steam erosion. Tests indicate a resistance to steam erosion approximately 60 times that of conventional carbides.

Lactic or citric acid. Grade 608 was practically inert under all conditions when exposed to lactic or citric acid.



OXIDATION RESISTANCE. (Left to right.) Samples of 18-8 stainless steel, Grade 608 Chrome Carbide and tungsten carbide after exposure in air at 1850°F. for 24 hours. All were originally identical in shape and size. Grade 608 Chrome Carbide appears to be virtually completely resistant to oxidation at all temperatures up to 1000°C. (1832°F.). Samples subjected to 1850°F. were only slightly discolored.

CEMENTED CHROME CARBIDE *abrasion, erosion*

New Grade 608 Carboloy Cemented Chrome Carbide, first of the new Series 600 Chrome Carbides, with chromium as principal ingredient, gives high resistance to corrosion or erosion, combined with good abrasion resistance. Opens new areas for carbide benefits, new product design. First sample test quantities now available; production quantities soon. For properties, sample kit, suggested uses of this great new Carboloy created-metal, see below.

Now available for your product designers, process engineers and metallurgists . . . sample test quantities of Carboloy Grade 608 Cemented Chrome Carbide, first in an entirely new series of metallic carbides.

Series 600 Chrome Carbides contain chromium as the principal ingredient. They are cobalt-free and practically tungsten-free. They feature high resistance to corrosion or erosion, combined with good abrasion resistance.

Field tests already point up exciting new areas where Series 600 will bring new cuts in costs, new highs in performance. Undoubtedly, *your* field, *your* product may benefit, too. Use sample kit to start your preliminary metallurgical and chemical tests of Grade 608 today.

An expansion of carbides

Series 600 Chrome Carbides are light in weight, completely nonmagnetic and have a coefficient of thermal expansion about the same as that of steel. They are as machineable and as hard as tungsten carbides. They are stable and strong.

Fabricating and finishing techniques are the same as tungsten carbides. A flash plating of nickel makes Chrome Carbide blanks (as sintered or as ground) readily brazable with conventional brazing materials.

Series 600 may overlap a few tungsten carbide applications. But because of their unusual wear-proofing properties, their wear- and corrosion-resistance, look to Chrome Carbides for famous carbide benefits in many new areas of industrial and product applications. Here may be new opportunities for you, starting with Grade 608.

GAGE ANVILS currently being made of Grade 608 Chrome Carbide. In gage blocks, ring gages, plug gages and gage anvils, Chrome Carbide has already shown an outstanding ability to resist corrosion and abrasion. Since its coefficient of thermal expansion is about the same as that of steel, readings are not affected by temperature variations.

MICROSTRUCTURE of Carboloy Grade 608 Chrome Carbide shows appearance unlike any other metal. Note, particularly, the uniformity and interlocking character of the grain structure. Chrome Carbide is lighter in weight than tungsten carbide; facilitates handling and use of solid carbide. It will pay to start your laboratory tests on Chrome Carbides now.

WHERE CAN YOU USE GRADE 608 CHROME CARBIDE?

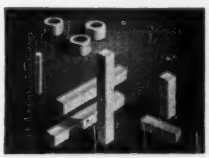
Field tests indicate new Series 600 Chrome Carbides offer unusually high resistance to corrosion or erosion combined with good abrasion resistance. For example, the following applications are suggested for Grade 608. Where else can you use Grade 608 Chrome Carbide?

- **Sheer blades for molten glass**
- **Core pins for baking ceramic parts**
- **Fishing rod guides**
- **Centrifuge nozzles, separating equipment**
- **Bearings where corrosives are present**
- **Textile guides**
- **Nozzles and valves: soaps, fats, oils, foods, chemicals, petroleum products, pharmaceuticals, fruit juices**
- **Valve and core pins, die casting**
- **Punches for movie film**
- **For many applications where stainless steel is not sufficiently abrasion-resistant**

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
Detroit 32, Michigan

"Carboloy" is the trademark for the products of Carboloy Department of General Electric Company

Use Coupon
to order sample kit today



CARBOLOY Department of General Electric Company
11125 East 8 Mile Road, Detroit 32, Michigan

Please send ( ) sample test kits of Grade 608 Carboloy Cemented Chrome Carbide at special price of $10.75 each. (Technical Bulletin included.)

Enclosed is ☐ Check ☐ Money Order ☐ Purchase Order for $_____

☐ Please invoice us.

☐ Please send Technical Bulletin WR-104 only.

Send to_____ Title_____

Name of Company_____

Address_____ City & Zone_____ State_____

WHAT *Life-Lines* REALLY DELIVER IS MORE SERVICE...LESS SERVICING

The time to stop explosions is before they start

And here's the equipment to do it

Dual Label Explosion-Proof Motor

In any location where Class II, Group G, or Class I, Group D explosive materials present a hazard, you can operate this Life-Line explosion-proof motor safely. It's underwriter approved for *both* explosive dusts and explosive vapors.

And the Life-Line offers extra protection against outages. Heavy steel construction provides greatest protection against physical damage. Pre-lubricated bearings need no further lubrication . . . eliminate outages due to faulty greasing. Superior winding techniques and insulation reduce electrical failures. Together they add up to longer life . . . less servicing.

For Hazardous Locations—Life-Linestarters®

Specially reinforced, cast enclosures with wide flame seals are available in Class I, Group D. Class II, Groups E, F, G are also available. Bi-metal overload relay protection and AB Circuit Breakers cut down time. In case of fault, no need to remove cover to reset breaker or overload relay mechanism. Service is restored immediately.

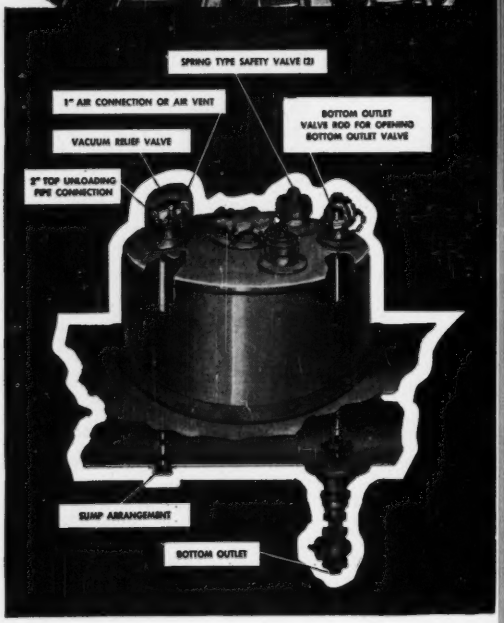
Simple design, single operation mean fewer operating parts to foul. Seesaw action of clapper prevents accidental operation. Kickout spring assures positive opening. Exclusive "De-ion®" arc quenching plus silver-to-silver contacts eliminates contact filing. Compare any other starter and see why Life-Lines offer more service with less servicing.

Together Life-Line motors and starters offer the food industry a new concept in performance. You get more service on the job . . . less down time and servicing. Ask your Westinghouse representative for complete details on both, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21701

YOU CAN BE SURE...IF IT'S
Westinghouse

Life-Line
MOTORS and CONTROLS

FACTS about PHENOL


SPRING TYPE SAFETY VALVE (2)
1" AIR CONNECTION OR AIR VENT
VACUUM RELIEF VALVE
2" TOP UNLOADING PIPE CONNECTION
BOTTOM OUTLET VALVE ROD FOR OPENING BOTTOM OUTLET VALVE
SUMP ARRANGEMENT
BOTTOM OUTLET

THE importance of phenol in so many industries has lead Dow to believe that the following information may be of assistance in helping you realize greater value from phenol.

Phenol is used in many manufacturing processes. It is used in the manufacture of: bonding agents for plywood—thermo-setting type plastics—toluene—lubricating oils—lubricating oil additives—medicinals—dyes—perfumes—explosives.

Dow believes that complete and comprehensive information about phenol is extremely valuable at this time and is ready to help you further with advice and technical assistance. If you desire additional information, write to Dow, using coupon below.

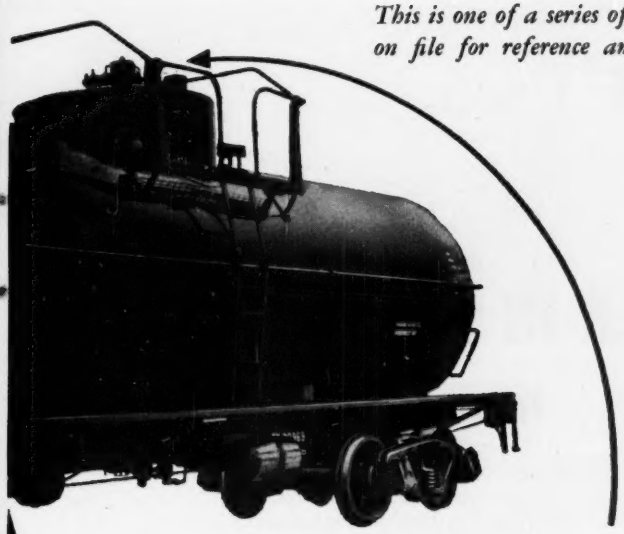
1. *Top unloading by pumping*

(1) Remove housing covering 1″ air vent valve and 2″ top unloading pipe valve. (2) Vent the car carefully by opening the 1″ vent valve. To make sure that car is vented, open manhole cover bolts one turn at a time until cover is loose. If there is no pressure present, open manhole cover. (3) Connect low pressure steam to car heating coils. (4) Avoid heating contents of the car above 70°C. Phenol should be ready for unloading when the bottom and ends of the car are warm to the hand, providing the car is not insulated. (5) Remove the plug from the 2″ top unloading valve and make sure that there is no unmelted phenol or foreign matter obstructing it. (6) Connect discharge side of pump to line running to the storage tank. Storage tank should be well vented. (7) Connect unloading line to the suction side of pump. The manhole cover may be left open for inspection. (8) Disconnect the piping after phenol has been pumped from car and wash off any phenol. Close all dome openings and blow out steam coils to prevent any residual condensate freezing and bursting the coils. Do not replace steam inlet and outlet caps. (9) Turn "Dangerous" placard to indicate empty car now is ready to return to Dow.

2. *Top unloading by air pressure*

Prepare the car for unloading by following items (1) through (5) under top unloading by pumping. Then: (6) Close manhole cover and bolt securely in place. (7) Connect the unloading line to the 2″ top unloading pipe connection. Be certain the storage tank is vented. (8) Connect the air supply line (air pressure not to exceed 20 p.s.i.) to the 1″ vent valve. (9) Observe the same procedure after the car is empty of phenol as before.

This is one of a series of Dow advertisements you may wish to keep on file for reference and information. Write Dow for reprints.



UNLOADING PHENOL TANK CARS

Be sure that tank cars stand on a level section of track in order to assure complete unloading of the car. Either of the following two methods may be used, but the first, *top unloading by pumping* is the safer, and the one recommended.

Physical Properties of Phenol

Phenol is a white crystalline chemical compound with an easily recognized aromatic odor.

Molecular Weight	94.11
Congealing or Freezing Point	40.9°C.
Boiling Point at 760 mm. Hg.	182.0°C.
Density	
Solid—at 25°C.	1.071 g./ml.
Liquid—at 50°C.	1.049 g./ml.
Critical Points	
Critical Temperature	419°C.
Critical Pressure	60.5 Atmospheres
Specific Heat	
Solid—at 4.0°C.	0.306
—at 22.7°C.	0.338
Liquid—70-74°C.	0.548
Viscosity	
Liquid at 45°C.	4.0 centipoises
Heat of Fusion	2690 cal./g. mol. 28.6 cal./g. 51.5 B.t.u./lb.
Heat of Vaporization at 182°C.	103.4 cal./g. 186.1 B.t.u./lb.
Heat of Combustion	732 K. cal./g. mol.
Flash Point	79.0°C.
Solubility	
Water in Phenol at 25°C.	71.28 g./100 g. solution
Phenol in Water at 25°C.	8.66 g./100 g. solution

Phenol is soluble in all proportions at room temperature in alcohol, benzene, monochlorobenzene and ether.

If you have a Phenol problem

write DOW for information and technical assistance

STORAGE

In solid state, phenol may be stored in the original container for considerable time without discoloration. Molten phenol, however, discolors when in contact with iron or copper-bearing metals. The higher the temperature, the more rapid the discoloration.

Storage tanks may be either welded or riveted construction. Tanks are usually equipped with steam coils for melting the phenol (temperatures should not exceed 70°C.) for transfer.

TRANSFER

When molten, phenol can be transferred like any other liquid, by gravity, pumping or blowing. Centrifugal and turbine type pumps are generally used and are satisfactory. A pump manufacturer can recommend suitable equipment when your requirements are known. Long fiber asbestos, lubricated with graphite, gives reasonable service when used as a pump packing. Pipe lines for handling phenol should be heated to maintain it in a liquid state. Steam-traced lines are usually used. Outside pipe lines in cold climates should be traced with ⅜″ to ¾″ steam lines dependent on the length of run and size of the line to be heated, with the tracer along the bottom of the pipe line, and both covered together with standard pipe covering. Short runs inside heated buildings should be traced on the under side of the pipe line, but need not be covered to keep the phenol above its melting point if more than 100 p.s.i. steam is used in the tracer line.

PRECAUTIONARY MEASURES

Phenol produces painful and dangerous burns of the skin in a very short time and death may result from external contact even on an area as small as the hand and forearm. It is classified by the Interstate Commerce Commission as a Class B poison and all containers bear the prescribed "DANGEROUS" placard or "POISON" label. Fumes are irritating to eyes and nose.

Persons engaged in handling phenol should always wear goggles or face shields and rubber gloves. Additional protection such as rubber boots, aprons and hoods may be advisable.

There should be adequate washing facilities immediately available. These facilities should include a shower bath or a water hose which gives a large stream of water under low pressure. For washing eyes, use a flow of water under low pressure.

In case phenol is spilled, it should be thoroughly washed away with water. Torches or heat sources other than low-pressure steam should never be used on phenol containers. No workman should ever be permitted to enter an empty tank or car which has been used for phenol until it has been thoroughly washed out, followed by a thorough steaming for approximately 12 hours.

In case of accidental contact: 1. Begin a thorough washing with large volumes of water. 2. Remove all contaminated clothing. 3. Call a physician.

THE DOW CHEMICAL COMPANY
Midland, Michigan

The Dow Chemical Company, Dept. OC7,
Midland, Michigan

☐ **Please send _____ reprints of this phenol advertisement.**

Name_____ Title_____

Company_____

Address_____

City_____ State_____

DOW

CHEMICALS

INDISPENSABLE TO INDUSTRY AND AGRICULTURE

PERMUTIT®

...THE PIONEER IN ION EXCHANGE

First in 1912 . . . First TODAY!

40 years of intensive research and practical application have gone into the development of Permutit ion exchange resins and equipment. 40 years, during which The Permutit Company has built an organization unequalled in the ion exchange industry.

Only Permutit offers undivided responsibility for the design, manufacture and supply of all types of resins . . . as well as the equipment for the fullest utilization of their chemical properties. Only Permutit does the *complete* job.

Permutit is proud to have contributed these milestones to the new and rapidly expanding field of ion exchange.

1912. The Permutit Company was founded to pioneer the application of ion exchange to the treatment of water. This revolutionary process utilized the first synthetic zeolite or cation exchanger, Permutit M, a sodium aluminosilicate.

1918. Permutit developed a process for stabilizing and increasing the capacity of naturally occurring greensand glauconite. This material, sold as Zeo-Dur, is still the best material known for certain applications.

1921. Permutit developed a wet process sodium aluminosilicate ion exchanger, Decalso. This cation exchanger was later used in one of the earliest applications of ion exchange outside the field of water treatment . . . in a process for making milk more digestible for infants.

1936. Permutit manufactured the first commercial organic cation exchanger . . . Zeo-Karb. This was the first material that could be operated on both the sodium and hydrogen cycles.

1937. Permutit manufactured the first commercial anion exchange resin, Demineralite, for removing anions from solution. The first commercial demineralizing installation was made employing this material in conjunction with a hydrogen regenerated cation exchanger to produce the equivalent of distilled water.

1943. Permutit made the first mixed bed demineralizing unit for the Armed Forces.

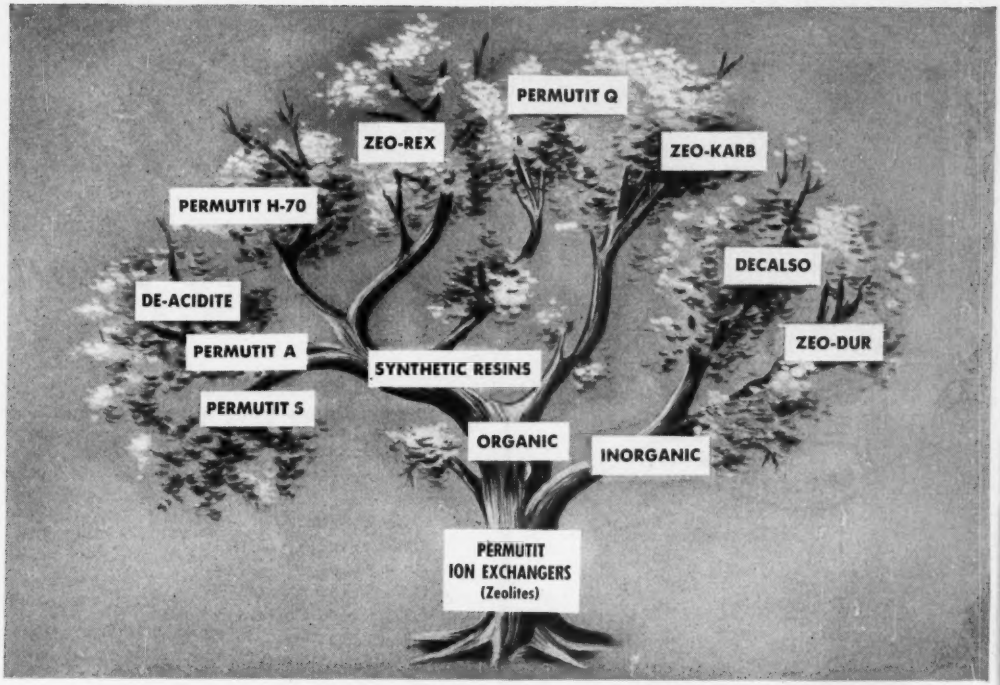
1944. Permutit developed and produced for the Armed Forces an ion exchange material, Permutit Ag, for the making of potable water from sea water.

1946. Permutit was again first with the announcement of a highly basic anion exchange resin, Permutit S, and introduced the revolutionary and practical process for making silica-free demineralized water.

1951. Permutit devised the first commercial process for the recovery of critical chromic acid and chromates, utilizing the high capacity cation exchange resin, Permutit Q, and the highly basic anion exchange resin, Permutit S.

1952. Now, as ever, for the latest in ion exchange research, look to Permutit. Permutit is the world's sole manufacturer of all types of ion exchange resins and ion exchange equipment.

ION EXCHANGE HEADQUARTERS FOR



We're proud of our Family Tree!

Four decades have elapsed since Permutit introduced zeolite (ion exchange) water softeners in the United States. Following is a brief description of the most widely used Permutit products—not simply better but the best that can be made.

ZEO-DUR®—A processed glauconite (naturally occurring greensand). It is rugged, rapid, long-lived and is regenerated with salt. Exchange capacity 2.8 kgr./cu. ft.*

MANGANESE PERMUTIT—A processed glauconite used for removing iron, manganese and hydrogen sulfide from water. Regenerated with potassium permanganate.

ZEO-KARB®—A sulfonated coal. Widely used for removing metal cations at low concentration. It is regenerated with salt or acid. Exchange capacity 8 kgr./cu. ft.

DECALSO®—A precipitated synthetic gel type sodium aluminosilicate. Exchange capacity 12 kgr./cu. ft.

ZEO-REX®—A sulfonated phenolic type cation exchange resin, regenerated with salt or acid. Exchange capacity is 13-14 kgr./cu. ft.

PERMUTIT Q—A sulfonated styrene cation exchange resin with a high exchange capacity. Stable at high temperatures and pH, resistant to oxidizing conditions. Regenerated with salt or acid. Exchange capacity 25-30 kgr./cu. ft.

PERMUTIT FOLIN—A modification of Decalso, used in laboratories for determining ammonia by the Folin method.

**Exchange values given above are approximate only and are given in kilograins of $CaCO_3$ per cubic foot of ion exchanger.*

PERMUTIT T—Used in determination of vitamin B by the Thiochrome method.

PERMUTIT Ag—Used in Permutit Seawater Desalting Kit. By shaking seawater for 20 minutes with this resin, the seawater is desalted to make a good drinkable water.

PERMUTIT S—A highly basic quaternary amine anion exchange resin for removing silica from water in the ion exchange demineralizing process. Regenerated with sodium hydroxide. Exchange capacity is 15 kgr./cu. ft.

PERMUTIT H-70—A high-capacity carboxylic acid resin. Used for separation of amino acids, alkaloids, etc. Exchange capacity is very high.

DE-ACIDITE®—An aliphatic amine anion exchange resin of high reaction speed. Used in second step of the ion exchange demineralizing process. Regenerated with soda ash. Exchange capacity is 19 kgr./cu. ft.

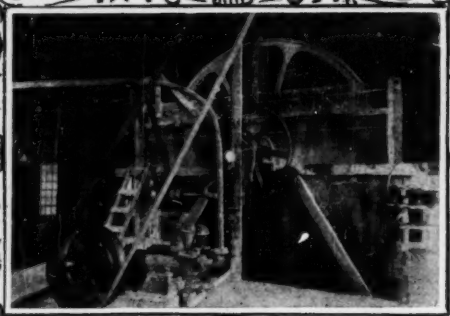
PERMUTIT A—A moderately basic anion exchange resin to remove weak acids from solutions. Regenerated with sodium hydroxide. Exchange capacity is 20 kgr. cu. ft.

PERMUTIT DR—A specially prepared decolorizing resin useful for removing color from solution.

Send for full information. Samples of resins will be furnished for test purposes. Write to The Permutit Company, Dept. CE-7, 330 West 42nd Street, New York 36, New York; or to Permutit Company of Canada, Ltd., 6975 Jeanne Mance Street, Montreal, Canada.

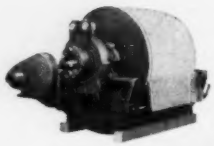
FORTY YEARS...

PERMUTIT®

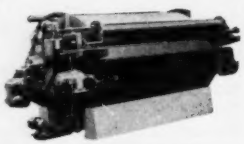


45 Years ...dating from

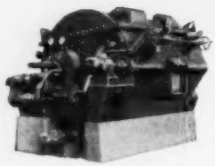
FROM THIS TO THESE



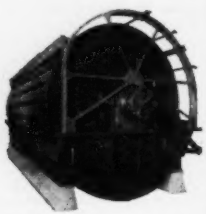
Oliver Chemical



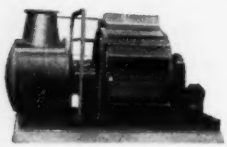
Oliver Precoat (Open)



Oliver Precoat (Vacuum)



Oliver Panel



Oliver Top-Feed

Oliver Horizontal Rotary

OLIVER UNITED'S EXTENSIVE TYPE SELECTIVITY

Today's Variations of the First Oliver Filter
(all continuous vacuum filtration)

Oliver Chemical Filter
Oliver Metallurgical Filter
Oliver Sewage Sludge Filter
Oliver Precoat Filter (open)
Oliver Precoat Filter (vapor tight)
Oliver Panel Filter
Oliver Pulp Type Filter
Oliver Ringvalve Filter
Oliver Top-Feed Filter
Oliver-Campbell Cane Mud Filter
Oliver Synrub Filter
Oliver Hopper Dewaterer

Plus Five Different Continuous Filters,
All Operating with the Basic Oliver Design
of the Ported, Bridged, Flat Valve

American Continuous Vacuum Filter
—Disc Type
Dorrco Continuous Vacuum Filter
—Internal Drum Type
Oliver Horizontal Filter—Vertical Axis Valve
Oliver Continuous Pressure Filter
—Standard Type
Oliver Continuous Pressure Filter
—Precoat Type
Rotexo Continuous Pressure Filter
—Disc Type
Oliver-Kellogg Continuous Pressure
Dewaxing Filter—Drum Type

Plus a Line of Batch Type Pressure Filters
to Round Out the Broad Oliver United
Service and Type Selectivity

Oliver Pressure Filter
Oliver-Beatty Pressure Filter
Sweetland Pressure Filter
Kelly Pressure Filter—Standard Type
Kelly Pressure Filter—Sulphur Type

of Filtration Progress
the first **OLIVER FILTER** *-1907*

That day in California, back in 1907 when the first Oliver Filter went to work, marked a turning point in process filtration practice. It brought practical, *continuous and automatic vacuum filtration* into the picture for the first time in this country. It pointed the way to faster, cleaner, and more economical filtration. It proved practicable a filtration method that soon became standard all over the world. It started a service in filtration engineering and in filter manufacturing that has grown to be world wide in scope and to include many different types of filters.

As we view it, five facets of Oliver United's service rate particularly high in value for those with filtration and clarification problems:

Experienced Personnel

A staff of 66 experienced filtration engineers are available to assist you from our New York, Chicago, Oakland and Hazleton Offices, several with the Company since its earliest days.

Wide Type Selectivity

Select from a score of distinctly different filters, covering all *three* principles of filtration: continuous vacuum, continuous pressure, and batch pressure; each type providing its special values.

Testing Facilities

Three fully-equipped laboratories for making test runs with experienced testing engineers in charge; test and pilot plant units for field testing under actual operating conditions.

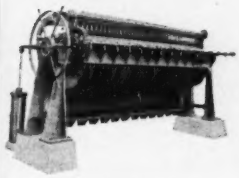
Development Program

For 45 years a must with Oliver United; the department responsible for (1) improving the design and construction of existing filters and (2) bringing out new units and major variations in existing types to meet new industrial problems.

World-Wide Service

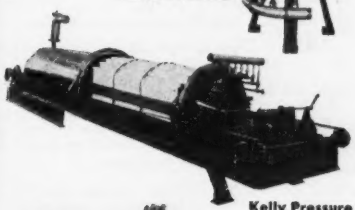
There are three sales-engineering offices and two factories in the United States. In addition there is manufacturing, sales and service throughout the world in charge of competent filtration engineers experienced with Oliver United equipment.

This, briefly, is Oliver United's service to those faced with filtration and clarification problems. Bring your filtration problems to the staff with 45 years "Know how", with offices and manufacturing facilities located all over the world.



Sweetland Pressure

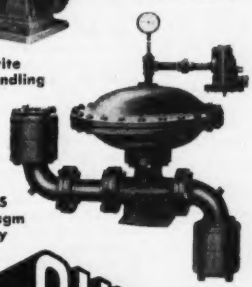
Oliver Pressure



Kelly Pressure

AND DON'T FORGET OUR PUMPS

Olivite Acid-Handling



O-D-S Diaphragm Slurry

NEW YORK 36 – 33 West 42nd Street • CHICAGO 1 – 221 North LaSalle Street
OAKLAND 1 – 2900 Glascock Street • SAN FRANCISCO 11 – 260 California Street
Export Sales Office – New York • Cable – OLIUNIFILT

FACTORIES: Hazleton, Pa. Oakland, Calif.

OLIVER UNITED FILTERS OUF INC. **INC.**

WORLD WIDE SALES, SERVICE AND MANUFACTURING FACILITIES

Direct Representation

WEST INDIES
Wm. A. Powe
Havana, Cuba

CANADA
E. Long, Ltd.
Orillia, Ontario

MEXICO & CENT. AMERICA
Oliver United Filters Inc.
Oakland, Calif.

HAWAIIAN ISLANDS
A. R. Duvall
Honolulu

PHILIPPINE ISLANDS
E. J. Nell Co.
Manila

AUSTRALIA
Hebart Duff Pty., Ltd.
Melbourne

Representation through The Dorr Company and its Affiliates

EUROPE, NORTH AFRICA & INDIA
Dorr-Oliver S. A. Brussels
Dorr-Oliver S.N.a.R.L. Paris
Dorr g.m.b.h. Wiesbaden (16)
Dorr-Oliver Co., Ltd., London, S.W. 1
Dorr-Oliver S.a.R.L. Milano
Dorr-Oliver, N.V. Amsterdam-C
Dorr-Oliver (India) Ltd., Bombay

SOUTH AMERICA & ASIA
The Dorr Co.
Stamford, Conn.

SOUTH AFRICA
E. L. Bateman Pty., Ltd.
Johannesburg, Transvaal

TYGON *Versus* NH_4OH

AMMONIUM HYDROXIDE, ammonium salts, ammonia liquors and ammonia gas have many uses. They likewise have many opportunities to cause considerable damage to plants and equipment. However, maximum use with minimum corrosion can be made of ammonia and its various compounds through the proper use of the versatile TYGON in its several forms.

The TYGON family of plastic compounds consists of a series of selected polyvinyl resins which are skillfully modified with other materials to exhibit the maximum in chemical resistance and general physical properties. In its various forms, TYGON finds many uses in many plants in many industries.

As a calendered or press-polished sheet, TYGON is primarily used as a lining or covering in equipment such as tanks, towers, reactors, vats, drums, hoppers, bins, blowers, impellers, fume hoods and fume ducts. Large amounts are also die-cut into gaskets for use as positive, enduring seals in all types of process equipment.

In the form of sheeting, TYGON resists all concentrations of ammonium hydroxide at temperatures ranging up to 160 °F. When subject only to ammonia fumes, the temperature limit can be raised to about 200 °F. Higher service temperatures are possible with a corrosion-resistant brick sheathing over the TYGON lining. On prolonged exposure to ammonium hydroxide, TYGON exhibits a slight hardening and change in color. However, its protectability is unaffected.

When used as gasketing, TYGON has the same resistance to NH_4OH as it does in sheet form. Temperature limits are higher with the maximum depending on the size, design, and manner of use of the gasket.

As an extrusion, TYGON is most widely used as tubing or piping. However, extruded solid cord, or channel, are also used as a gasketing, expansion jointing, or packing. In these forms, TYGON resists ammonium hydroxide in any concentration and at temperatures up to 160 °F. A slight stiffening and color change in the extruded TYGON may be noted with prolonged contact, but this does not affect its resistance.

TYGON Tubing has proved its worth in many laboratory and plant uses. Its glass-like clarity, full flexibility, smooth surfaces, light weight, high strength and long life make TYGON ideally suited to the fast, simple, safe transmission of virtually any liquid, gas, or semi-solid. The larger sizes, up to 2" ID, can be used to advantage as temporary or permanent transfer lines, as flexible connections and line desurgers, as syphon hoses, as oil and compressed air lines, and as inlet and outlet ports on pumps and filters. For pressure applications exceeding a constant head of 40 psi, particularly at elevated temperatures, braided jacket reinforcement is available and suggested.

As molded goods, TYGON exhibits the same resistance to NH_4OH as the extruded form. Specific pressure and temperature limits depend on the size and design of the piece. Typical molded TYGON items include gaskets, grommets, washers, closures, handles, bumpers and many other parts and fittings.

As a paint, TYGON usually sees service as a protective maintenance coating. As such the physical limits of a thin film must be realized. TYGON Paint protects plant and equipment against the fumes, spillage, or condensate of ammonium hydroxide in any concentration and at temperatures as high as 200 °F. Prolonged immersion, however, is not advised without the counsel of U. S. Stoneware engineers. For mild environments a primer and no less than two top coats should be used. For severe exposures a minimum of five coats plus primer is advised.

As a plastisol (TYGOFLEX), TYGON finds use as a heavy duty coating and in the casting or "slush" molding of flexible parts and fittings. It resists NH_4OH in all concentrations. Temperature limits depend on the thickness of the coating deposited.

In any of its forms, TYGON is low cost insurance against the attack of not only ammonium hydroxide and related chemicals, but a wide range of other alkalies, acids, oils, greases, and water. For best results with TYGON, consultation with U. S. Stoneware engineers is recommended.

TYGON plastics

In addition to TYGON in its various forms, we also manufacture a number of other materials capable of handling ammonium hydroxide in any concentration and under all types of operating conditions. These products include chemical stoneware and porcelain acid proof brick and cements, homogenous lead linings, and other organic linings and coatings.

Why don't you submit your corrosion problem today? There's no obligation and we'll be pleased to be of assistance. So write, now! 4702

THE UNITED STATES STONEWARE CO., Akron 9, Ohio

ENGINEERS, MANUFACTURERS, ERECTORS OF CORROSION-RESISTANT EQUIPMENT SINCE 1865

THE Chementator

Reg. U. S. Pat. Off.

Prepared under the editorial direction of Joseph A. O'Connor, News Editor

Newcomer in butyl rubber?

Goodrich and Gulf Oil may team up to build and operate a butyl rubber and butadiene plant at Orange, Tex. Raw materials would be piped from Gulf's Port Arthur refinery.

Of course, Goodrich and Gulf would have to be licensed by Standard Oil Development Co., which owns the patents on butyl rubber. At present, there are two butyl rubber plants in the U. S., one at Baton Rouge, La., operated by Esso and one at Baytown, Tex., run by Humble Oil. If Goodrich and Gulf go into butyl production, they will be the first U. S. firms outside the Standard Oil family to get a license.

Aniline by new catalytic process

Aniline and nitrobenzene will be made by a new continuous catalytic process in the $2.3 million plant that National Aniline will build south of Moundsville, W. Va. The plant will get its hydrogen from the neighboring plant of Solvay.

National Aniline expects to complete construction early next year. DPA has granted a 60 percent fast tax writeoff.

Tying in the National Aniline and Solvay plants is part of Allied Chemical & Dye's plan for closer integration of its units.

New horizon for plastics

DPA has called for production of 4.6 billion pounds of plastics by January 1955. That's an expansion of 2.5 billion pounds over 1950.

Twelve plastics are included. They are: phenolic, vinyl, styrene, urea and melamine, alkyd, cumarone-indene, polyester, acrylate and silicone resins, cellulose plastics, plastic nylon and polyethylene.

Capacity increases for the various monomers, plasticizers, compounding materials and additives are not pinpointed.

Expansion goals have previously been set for many important chemicals used in making plastics. Among them: phenol, formaldehyde, phthalic anhydride, maleic anhydride, calcium carbide, glycerine and chlorine.

Thus far, DPA has received 127 applications for certificates of necessity for the expansion of plastic producing facilities. The applications represent a proposed expansion of 2,559,469,000 lb.; with a capital outlay of $441,288,000.

Here's how they break down: synthetic resins—93 applications for a proposed expansion of 1,319,449,000 lb. at a capital investment of $250,690,000; monomers, plasticizers and compounding materials—34 applications with a proposed expansion of 1,240,020,000 lb. and a capital investment of $190,538,000.

Of the proposed total expansion, 126 million pounds were completed before January 1951, and were included in the rated capacity at that time.

DPA had certified 39 applications for plastics materials facilities by the end of the first quarter of 1952. They represent an expansion of 908,914,000 lb. and a capital outlay of $137,068,000. Yet to be acted upon are 88 applications calling for an expansion of 1,650,550,000 lb. at a capital cost of $304,160,000.

Raw materials: Will U. S. have enough in 1975?

The big threat that lies ahead for U. S. industry in raw materials is nothing as dramatic as an absolute shortage of these materials. It's something far more insidious: a creeping increase in the real cost of getting these materials. That means more man-hours of work and greater capital investment. It also means more imports from abroad. And above all, it means greater reliance on chemical engineering for more efficient extraction of materials from U. S. resources and for substitute materials to replace those that are scarce. These are the highspots in the report of the President's Materials Policy Commission.

U. S. consumption of raw materials will climb 50 to 60 percent between now and 1975, the Commission estimates, from 2.7 billion tons a year to around 4 billion. Imports may account for a fifth or even a quarter of this total in value.

Demand for minerals—metals, fuels and non-metallics—will rise most. They'll go up about 90 percent or almost double. Iron, copper, lead and zinc consumption may rise only 40 to 50 percent. More dramatic increases might be: fluorspar, threefold; bauxite for aluminum, fourfold; and magnesium, up 18 to 20 times —the largest increase for any material. Fluorspar is needed not only for steel making but for aluminum production, oil refining and the manufacture of the new fluorochemicals.

Titanium could upset relationships all the way from iron and steel to nickel, aluminum and magnesium if a good cheap process is found to produce it from abundant ore deposits. (Continued)

Heaviest demand for timber products will be a 50 percent increase in pulpwood requirements. Even so, demand for timber will rise the least—only about 10 percent.

About 40 percent more agricultural products will be required. Farmers could boost output from present acreage 200 percent by 1975 if they employed every good farming practice known and used fertilizers to the economic limit. A 75 percent increase could be expected through a more moderate increase in use of fertilizers alone. More and more industrial raw materials will come from the nation's farms in the next 25 years—witness the synthetic fibers.

Demand for industrial water will increase roughly 170 percent. The water problem, already serious, may be much sharper by 1975. Chemical industry, growing fast, in particular will be plagued.

Energy requirements will double. Electric power must increase about 260 percent—from 389 billion kilowatts in 1950 to 1,400 billion in 1975.

Even without war, demand for liquid fuels may more than double, demand for natural gas triple, and for coal, rise 60 percent. Coal will regain importance as petroleum and natural gas resources decline and grow costly.

New processes will be explored for getting synthetic fuels, both liquids and gases, from coal. Liquid fuels from oil shales will become economically feasible.

Electrochemical industries like aluminum need enormous quantities of energy; it takes 10 times as much energy to produce a pound of aluminum as a pound of steel. As hydro power dwindles, industries like aluminum will turn increasingly to cheap energy from low-grade lignite.

Today, the U. S. is a raw materials deficit nation. Of 74 strategic materials listed by the Munitions Board, the U. S. imports its entire supplies of more than 40, and imports at least part of virtually all the rest. Of more than 100 mineral materials used in industry, about a third comes entirely from within the country, another third comes partly from abroad, and the final third comes almost entirely from abroad. And this last third includes high-grade quartz, columbium and cobalt—needed today for electronic equipment and high-temperature alloys. The U. S. now imports iron ore and petroleum in volume. Once the world's largest exporter, this nation now gets huge imports of lead, zinc and copper.

In recent years, U. S. private investment abroad in mining and smelting has averaged around $50 million a year. The Commission estimates that $100 million a year will be needed for the next 25 years just to provide the requirements of the free world for copper alone.

A flexible technology, especially a strong and adaptable chemical industry, is the nation's one resource that cannot be depleted. However, the U. S., the Commission reports, is below par both in technically trained personnel and in basic scientific knowledge. And more and more of the money for research is coming from the federal government. Of the $2.9 billion total 1952 research bill in the U. S., the government's share comes to $1.6 billion. But 90 percent of the federal money is poured into research on weapons and war equipment. Moreover, the Commission finds, materials research has no head or focus in the government.

Pair of petrochemical plants

A brace of new chemical plants, one at Lake Charles, La., and the other at Port Neches, Tex., have been granted fast tax writeoffs of 50 percent each by DPA.

Largest of the two is the plant of American Petrochemical Corp. at Lake Charles, estimated to cost $26,640,000, while the new unit of Jefferson Chemical Co. at Port Neches will cost $18,700,000.

At Lake Charles, American Petrochemical will produce vinyl chloride and ethyl chloride, as well as ethylene glycol.

American Petrochemical is a joint venture of Cities Service and Firestone Tire & Rubber.

Jefferson Chemical's expansion at Port Neches will add facilities for the manufacture of ethylene oxide and ethylene glycol. Construction will probably start late this year.

Jefferson says plans call for the laying of an additional feed gas line from the Port Arthur refinery of the Texas Co., the construction of an ethylene cracking and fractionating unit, and units for ethylene oxide and glycol.

Three-for-one split in Dow stock

Common stock of Dow Chemical Co. may be split three for one. Dow's board of directors has recommended that common stock be increased from 12 million shares, having a par value of $15 each, to 50 million shares of $5 par value, and that each of the outstanding common shares be exchanged for three of the new shares.

Before the split becomes effective Dow stockholders have to agree to it. They meet next month to decide.

Another Gulf Coast plant for Carbide

Ethylene oxide and polyethylene resins, as well as other synthetic organics, will be produced in the new plant of Carbide & Carbon Chemicals, to be built near Seadrift, Tex.

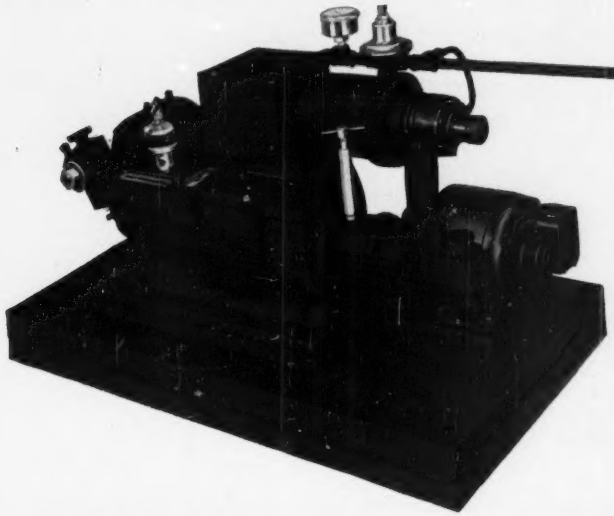
A fast tax writeoff has been granted, and construction of the multi-million dollar plant begins this fall. In full operation, the plant will employ about 750.

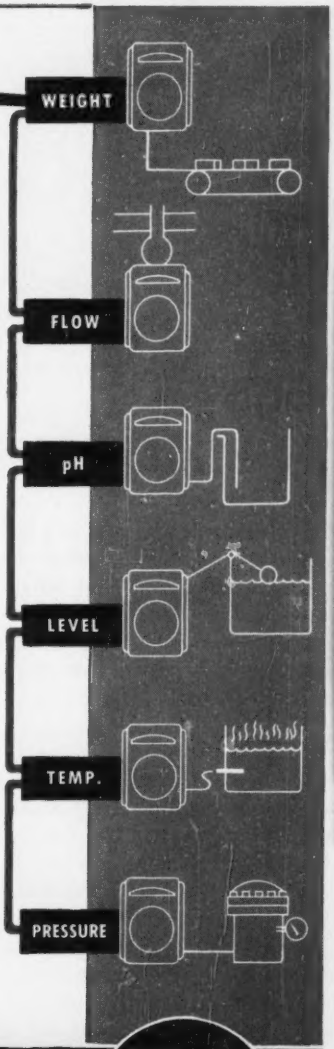
Ethylene oxide is an important raw material for many chemical products needed for defense. In the

(*Continued on page 110*)

Inject { ADDITIVES / INHIBITORS / DYES / PERFUMES / REAGENTS } *Automatically*

in Proportion to Variable Process Demands





% PROPORTIONEERS, INC. % pneumatic control Adjust-O-Feeder automatically regulates the feed of a secondary fluid in proportion to the demand of *any* process variable. Fluctuations in the metered variable create corresponding air pressures to actuate the positioner which, in turn, regulates the speed of the Adjust-O-Feeder metering pump. This new unit proportions additives, inhibitors, dyes, perfumes, and reagents in prescribed quantities with dosage adjustment to 1 part in 60. Adjust-O-Feeder metering pumps are available in sizes ranging from a few cubic centimeters per minute to 10 gallons per minute and will handle accurately both viscous and non-viscous fluids.

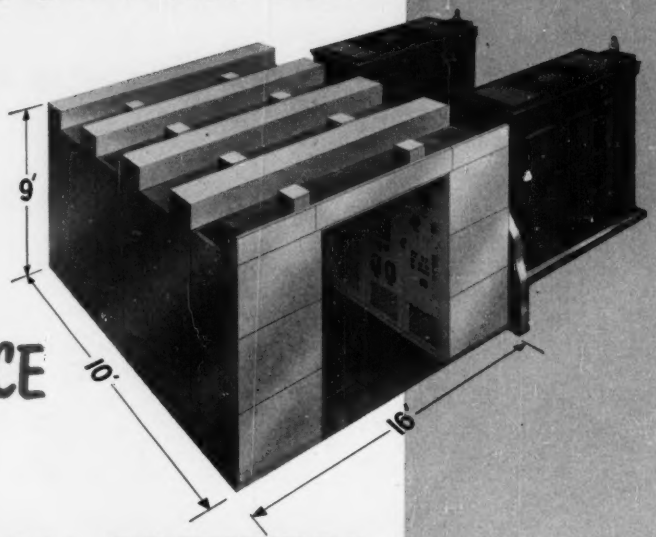
Ask for information and recommendations.

% PROPORTIONEERS, INC. %

Write to %PROPORTIONEERS, INC.%, Harris Ave., Providence 1, R. I.

Technical service representatives in principal cities of the United States, Canada, Mexico and other foreign countries.

RECTIFY AC TO DC WITH 96% EFFICIENCY



...IN SMALL, COMPACT SPACE

Install I-T-E MECHANICAL RECTIFIERS

On processes requiring a heavy, steady supply of direct current, I-T-E Mechanical Rectifiers yield big dividends. Not only do they give you more d-c for the power you buy (96% efficiency from a-c line to d-c bus) but you also get more power per cubic foot — *high capacity in small space.*

SAVE SPACE

Simplicity of design plus unified arrangement of steel enclosures assures most economical use of floor space. The 10,000 ampere I-T-E Mechanical Rectifier pictured here requires a *total* floor area of only 160 square feet including operating aisle. A 5,000 ampere installation requires only 120 square feet including aisle. Ceiling need be no higher than 12 feet.

Power transformers are normally located outdoors and throat-connected to the Rectifier cubicle through an outside wall. Overall dimensions vary with KVA and ratio of the transformer. A 1000 KVA transformer nominally occupies 35 square feet.

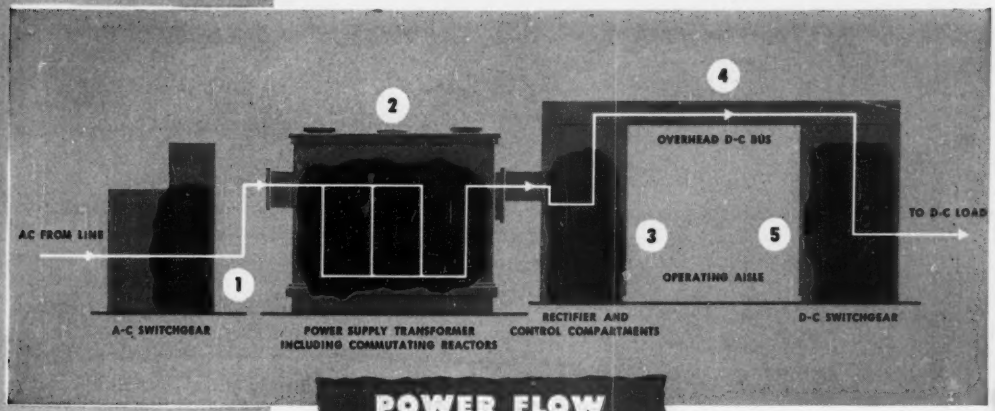
The primary a-c circuit breaker which feeds the transformer forms part of the Rectifier installation, but is ordinarily included in a line-up of HV switchgear at some convenient remote point. A 5 KV circuit breaker, 100,000 KVA interrupting capacity, 1200 amperes continuous rating (draw-out construction), occupies 10 square feet of floor space.

SAVE ON BUILDING COSTS

The compact Mechanical Rectifier installation is light in weight. It requires no special floors, foundations, or high ceilings—no basement or trenching for buses. The Rectifier stands just 9 feet tall—including *overhead* bus —on an ordinary level floor.

SAVE ON INSTALLATION COSTS

Factory assembled, wired, and tested, the I-T-E Mechanical Rectifier is delivered as a packaged unit—ready to install. No special equipment or crane facilities are needed. Just unload components, skid enclosures into position, wheel truck-mounted elements into cubicles, connect . . . and the Rectifier is ready to deliver long, dependable service.



POWER FLOW
FROM A-C LINE TO D-C LOAD

A complete I-T-E Mechanical Rectifier includes: primary a-c circuit breaker, transformer, commutating reactor, contact mechanism, d-c switchgear, and associated instruments and controls.

Incoming alternating current is fed through primary circuit breaker (1) into the combined transformer and commutating reactor (2), to the contact mechanism (3), where it is converted to direct current.

The direct current then travels across the overhead bus (4), through d-c switchgear (5) to feed the load.

CAPACITY RANGE

Standard ratings for unit installations are: 3000, 4000, 5000, 6000, 7000, 8000, 9000, and 10,000 amperes. Any additional desired capacity may be obtained by paralleling units of suitable ratings.

Output voltage may be any voltage between 50 and 400 volts d-c.

Common primary voltages are: 2300 volts; 4160 volts; 13,800 volts; and 23,000 volts; three-phase, 60-cycle, a-c.

GET THE COMPLETE STORY

If you're planning new or expanded power conversion facilities, it will pay you to investigate the advantages of I-T-E Mechanical Rectifiers. You get maximum efficiency—in minimum space. You save all along the line.

For complete information, get in touch with your local I-T-E representative without delay. Or, send for illustrated *Bulletin 5106* today.

I-T-E

MECHANICAL RECTIFIERS

I-T-E CIRCUIT BREAKER COMPANY
Rectifier Division
19TH AND HAMILTON STREETS, PHILADELPHIA 30, PENNSYLVANIA

Canadian Mfg. and Sales: Eastern Power Devices, Ltd., Toronto • Export Sales: Philips Export Corp., N.Y. 17, N.Y.

new resin units at Seadrift, polyethylene resins will be made by direct polymerization of ethylene at high pressure. Their production will be part of a major expansion in plastic resins in which Carbide is currently engaged.

The new Seadrift plant, which is about 25 mi. southeast of Victoria, will be Carbide's second large plant on the Gulf Coast of Texas, the other being the huge chemical plant at Texas City.

Alaska's first pulp mill

Construction is just getting started on Alaska's first pulp mill at Ward Cove near Ketchikan. The $45 million plant, which will take two years to build, is the largest industrial enterprise ever undertaken in Alaska.

Ketchikan Pulp Co., a new company jointly controlled by Puget Sound Pulp & Timber Co. and American Viscose Co., will operate the mill.

High-grade dissolving wood pulp will be produced by a magnesia base pulping process. Pulp will be sent to the eastern seaboard of the United States, where it will be processed into rayon and cellophane in plants of American Viscose.

Wood for the mill will come from the densely timbered Tongass National Forest of southeastern Alaska. Ketchikan Pulp has a contract with the U. S. Forest Service for a 50-year supply of timber for a mill of 525-ton daily capacity. Initially, the plant will produce 300 tons a day, but capacity will be increased in a few years.

This mill is but one of five or six pulp and paper plants that the Tongass National Forest can support, according to Lyle F. Watts, chief of the Forest Service. With 80 billion board feet of timber, mostly hemlock and spruce, this forest could underpin a healthy new industry for Alaska, one that could produce many grades of pulp and paper, including newsprint.

Nor would pollution necessarily be a problem. The new mill, for example, using magnesia pulping, has been designed to prevent pollution of the tidal waters on which it will stand.

Atlantic expanding chemical activities

Capital expenditures of Atlantic Refining Co. of Philadelphia will approximate $83 million this year. More than half will go into a worldwide search for crude oil.

But a sizable chunk of this capital will go into new manufacturing facilities. A new still, rated at 50,000 bbl. per day, and a new catalytic cracking unit will be under construction this year. Chemical production capacity will also be expanded by the addition of an ammonia plant and the enlargement of the synthetic detergent unit.

New chlorosulphonic acid plant in Ohio

Tennessee Corp. is building a $500,000 plant at Lockland, Ohio, to produce chlorosulphonic acid. When completed this fall the new plant will furnish acid to Tennessee's customers for use in sulphonating.

First newsprint plant for Mexico

Mexico plans to build its first newsprint plant with the help of Italian capital and engineers. The plant, to cost $11.5 million, will be built in the state of Durango in the forest area of northwest Mexico.

Italy's Snaia Viscosa Corp. will put up 25 percent of the capital and provide technical know-how. The rest of the money will come from private Mexican capitalists and from Nacional Financiera, the government credit corporation.

Snaia Viscose recently announced plans for a cellulose plant in the state of Chihuahua, to be financed in cooperation with Mexican private and government capital.

Estimated production of the proposed newsprint plant has not been disclosed. It will turn out only part of the 60,000 tons of newsprint used yearly by Mexico.

Lithium: from household to hell bomb

NEW GOAL—Lithium has suddenly become so important that the government has called for production of 10 million pounds a year of lithium compounds by January 1955. Almost certainly lithium will be needed for production of hydrogen bombs. Other industrial and defense uses for the light metal are mounting. Producers are feverishly expanding capacity.

The new goal of 10 million pounds a year of lithium compounds by the beginning of 1955, just set by the Defense Production Administration, represents an expansion of more than 6 million pounds, as lithium carbonate, over capacity in January 1951. Actually, since 1,175,000 lb. of 1951 capacity was based on use of a raw material no longer available, new capacity will be required for production of 7.36 million pounds of lithium compounds.

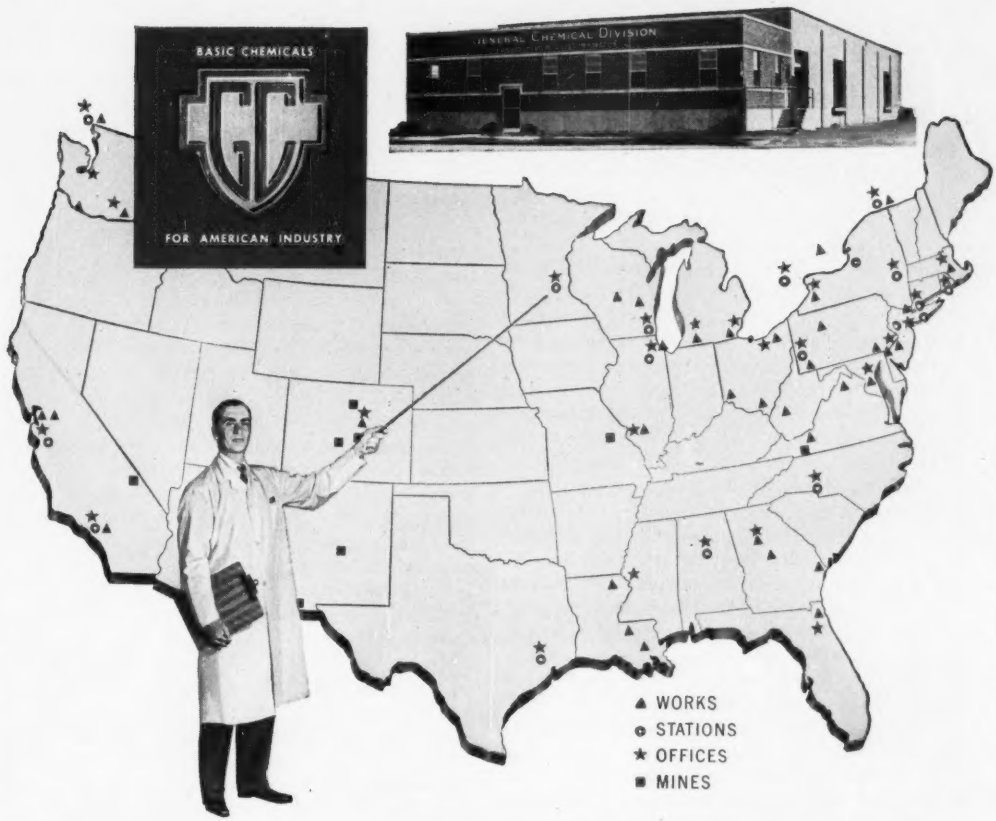
Because 1.5 million pounds of added capacity already has been constructed without help from the government, the expansion eligible for government aid is 5.86 million pounds. Certificates of necessity already recommended for approval would provide 5.22 million pounds of capacity annually, according to DPA. This leaves 640,000 lb. yet to be provided for.

PRODUCERS EXPAND—Foote Mineral has jumped off in a three-pronged offensive to lift production of lithium. The $3 million operation calls for: (1) putting up a processing plant at Sunbright, Va., for lithium chemicals; (2) tripling output of lithium ore at Foote's Kings Mountain, N. C., mine; and (3) constructing facilities for processing limestone at Sunbright.

(*Continued on page 112*)

GEARED TO MEET TODAY'S NEEDS

General Chemical's Distributing Station Now... Finer Than Ever!



TO HELP SUPPLY Industry's chemical requirements swiftly and smoothly, General Chemical has created *almost 100 service and supply points across the country.* Among these is General's extensive chain of Distributing Stations now equipped to provide finer services than ever in major centers of commerce.

MANY HAVE BEEN greatly expanded over the past year. Some have been relocated in large new quarters designed especially for storing and shipping heavy, fine and laboratory chemicals.

THIS MONTH, General is moving its Minneapolis Station into the large new office and warehouse pictured here. Recently, it opened similar quarters for its Stations in Albany and Syracuse, N. Y., Birmingham, Ala., Houston, Texas, and Montreal, Quebec.*

EACH EXPANSION, each new station, has been created for a single purpose—to mesh with General Chemical's Producing Works in providing the best possible service to chemical consumers from coast to coast.

THESE MODERN integrated distribution facilities can mean much in handling your chemical purchasing problems wherever your operations may be located. You will find them particularly advantageous if you have many plants being served by a central purchasing department.

Let us put these facilities to work for you—soon!

GENERAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.
Offices in Principal Cities from Coast to Coast

*In Canada: The Nichols Chemical Company Limited

ACIDS • ALUMS • SODIUM COMPOUNDS • PHOSPHATES • FLUORINE DERIVATIVES • REAGENTS & FINE CHEMICALS

A new process will be used by Foote at Sunbright to get lithium and it salts from spodumene. Unlike the process used by Metalloy Corp., a division of the Lithium Corp. of America, the new Foote process requires no sulphuric acid. Hence there's no formation of intermediate lithium sulphate. Instead, such products as lithium carbonate, chloride, bromide and hydroxide are produced directly. Lithium metal will also be produced.

The Sunbright plant will more than double present U. S. capacity for lithium chemicals. Blaw-Knox designed the plant and is just getting started on construction. The plant should be completed in mid-1953.

All raw materials processed at Sunbright will be basic ores mined by Foote or byproducts of other Foote operations.

More mining, milling and processing equipment will be installed at Kings Mountain for the recovery of spodumene. In addition, facilities for recovery of tin, mica, columbite and feldspar will be enlarged.

Late in 1951, Foote literally purchased a mountain of lithium when it bought the mine and recovery plant at Kings Mountain from Solvay. Kings Mountain contains the world's biggest known spodumene deposit, with over a million tons already proved.

Since taking over, Foote has doubled ore recovery, funneling 1,000 tons of head feed rock into the plant each day. The rock runs 20 percent ore, which is 6 percent lithium oxide. Using the entire cell line, 200 tons of spodumene can be recovered per day. And now Foote will triple output of the lithium ore.

Part of the lithium ore, after grinding and cleaning, will be shipped directly from Kings Mountain to the glass and ceramic industries. The rest will go to the new lithium plant at Sunbright.

Meantime, Lithium Corp. of America has likewise been expanding. At its ore processing plant at Keystone, S. D., a new $250,000 flotation mill for recovering spodumene concentrates is just getting into production. It will boost extraction of ore from the Black Hills deposits by 50 percent.

Lithium Corp. of America is also stepping up capacity at the St. Louis Park, Minn., plant of Metalloy Corp., where lithium compounds and lithium metal are produced. The cost will exceed $175,000.

MARKETS—Until recent years, when research opened up tempting new commercial markets, production of lithium and its compounds has been comparatively small. Now, however, industrial and defense needs are climbing.

In air conditioning and refrigeration, lithium bromide is moving in on ammonia. The market potential for lithium bromide for this use is estimated at the equivalent of 3 million pounds of lithium hydroxide.

Lithium greases, too, have a big potential—five times their present market within the next five years. Not long ago the armed forces were looking for over 10 million pounds of lithium greases, more than the industry's output could match.

Ceramics, traditionally the backbone of the lithium business, are second only to lubricants as a customer for these chemicals. Right now, ceramics account for about 30 percent of the lithium carbonate produced.

Lithium is even invading the household. Foote has developed a lithium hypochlorite bleach that is effective in water at less than 180 deg. F. This gives it a big advantage over present perborate bleaches in home washing machines.

Lithium fluoride is used in welding rod coatings. Other uses of lithium chemicals: in metallurgy, as catalysts and in pharmaceuticals.

Important defense uses are for greases, airplane de-icing, low-temperature batteries, carbon dioxide absorbents, signaling devices, jet engine tail pipe enamels and certain hush-hush uses.

HYDROGEN BOMB—Bombarding lithium with neutrons could produce tritium, the extra-heavy hydrogen isotope needed to fuel a hydrogen bomb. It's believed that's what Du Pont is to attempt in the mammoth Savannah River plant of AEC.

The lithium would have to be inserted in a pile similar to those at Hanford, Wash., to be bombarded with neutrons. One part in 10 of lithium is the light isotope Li_6. However, since it captures neutrons much more readily than Li_7, no separation would be necessary. Each time a neutron hit an atom of Li_6 it would form an atom of helium, plus an atom of tritium, fuel for a hydrogen bomb.

Tritium cannot be stored indefinitely. It's radioactive, and half of it is destroyed every 12 years. Moreover, it would have to be cooled to within a few degrees of absolute zero for loading into a bomb, and kept that way until the bomb exploded.

If a hydrogen bomb of the tritium-deuterium type is produced, and can be made to explode with about the same efficiency as plutonium, production of hydrogen bombs only 10 times as powerful as an atom bomb would require: (1) intensified development work on extreme refrigeration; (2) batteries of huge atomic reactors to transmute Li_6 into tritium; and (3) production of about half a ton of lithium metal per bomb. A hydrogen bomb 100 times more powerful than a present atom bomb has been predicted. It might require even more lithium.

Oil industry to spend $8 billion

To meet defense needs spelled out by the Petroleum Administration for Defense, the oil industry must spend $8 billion for expansion, replacement and improvement of facilities by the end of 1953. That's the estimate of President S. A. Swensrud of Gulf Oil. Since the end of World War II, the oil industry has spent $15 billion for expansion. *End*

FUELING... for fun or a fight

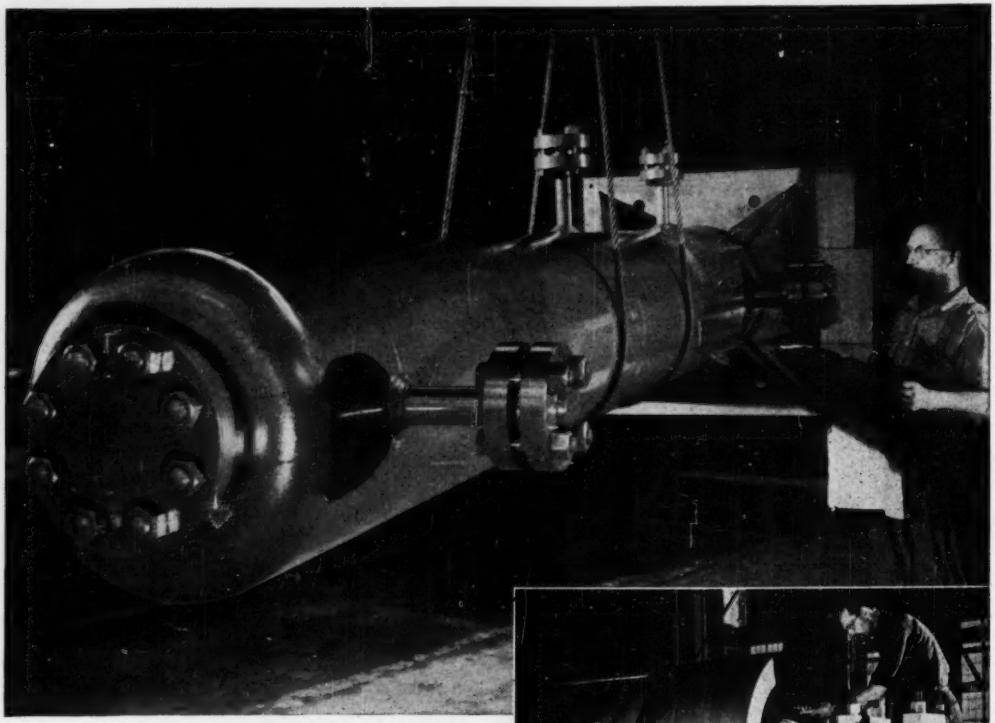
At the schoolground or in the stratosphere, flying takes fuel... whether it's only a thimbleful for a model or a tanker load for a Stratojet. Despite the difference in fuels, both may have come from the same oil well. Transforming crude into such varied types of fuel is a miracle worked by the petroleum industry... with an assist from chemistry.

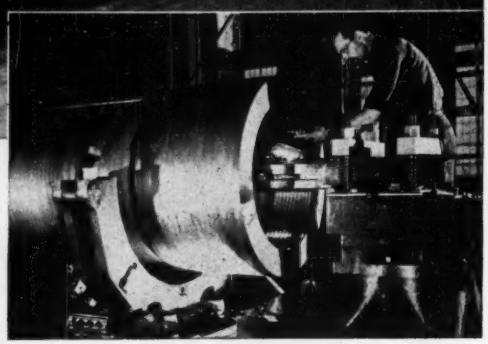
Closely associated with the petroleum industry, Mathieson—now in its 60th year as one of America's major chemical companies—today supplies petroleum processors with more basic chemicals than ever before... such products as caustic soda, ammonia, sodium chlorite, sulphuric acid, diethylene glycol, triethylene glycol, dichloroethylether.

A dependable source of supply for essential raw materials is always important. If your production requires any of these chemicals, you may be able to buy *to better advantage* by consulting with us now. Mathieson Chemical Corporation, Baltimore 3, Maryland.

Mathieson
CHEMICALS

SERVING INDUSTRY, AGRICULTURE AND PUBLIC HEALTH





Special Jobs in Pressure Vessels

Do your needs call for a pressure vessel that's somewhat different from the usual types? Like the one shown above, for example? If so, we suggest you have us build it.

For many years forged steel vessels have been a specialty at Bethlehem, and during those years we've made a good many with highly-unique features. Most of these jobs have taken some pretty complicated engineering. But, when finished, they've all been right in every detail, with every specification met in full.

Please don't think, however, that Bethlehem is interested only in "special" work. If your requirements are better served by a conventional type of vessel, we'll be glad to build it for you. Each individual step will be expertly handled . . . starting with the making of the steel and continuing through the various steps of forging, heat-treating, machining, and inspection.

Bethlehem is equipped to produce pressure vessels in virtually any size and type, and with almost any desired wall thickness. These units can be of single-section or multiple-section design, whichever the customer specifies. Why not check with us when drawing plans for your next installation?

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

★ BETHLEHEM STEEL ★

Bethlehem **FORGED-STEEL PRESSURE VESSELS**

You can't stop a bullet with a catcher's mitt

You can't stop corrosion with ordinary paints...

it takes BITUMASTIC COATINGS!

CORROSION can't be stopped by ordinary paints or conventional protective coatings. They can't protect surfaces against the ravages of rust for any appreciable length of time.

But Bitumastic Coatings can!

BECAUSE the six Bitumastic® Protective Coatings, unlike maintenance paints, are specially formulated from a coal-tar pitch base* that is, for all practical purposes, impervious to water. And when you keep moisture away from an exposed surface, you *stop* corrosion.

BECAUSE Bitumastic Coatings provide an extra-tough, extra-thick barrier against corrosive elements—a barrier that is impenetrable.

BECAUSE Bitumastic Coatings provide up to 8 times the film thickness of conventional paint coatings.

BECAUSE Bitumastic Coatings stop corrosion caused by moisture—acid fumes—alkaline fumes—corrosive soil—salt air—heat.

There are 6 Koppers Coatings—formulated to control corrosion of metal and deterioration of concrete. Use the coupon for full information.

**Hi-Heat Gray contains heat-resistant metallic base.*

SEND FOR SET OF FREE BOOKLETS!

Koppers Company, Inc.
Tar Products Division
Dept. 759-T, Pittsburgh 19, Pa.

Please send me, without charge or obligation, your booklets on corrosion prevention.

Name.....

Address.....

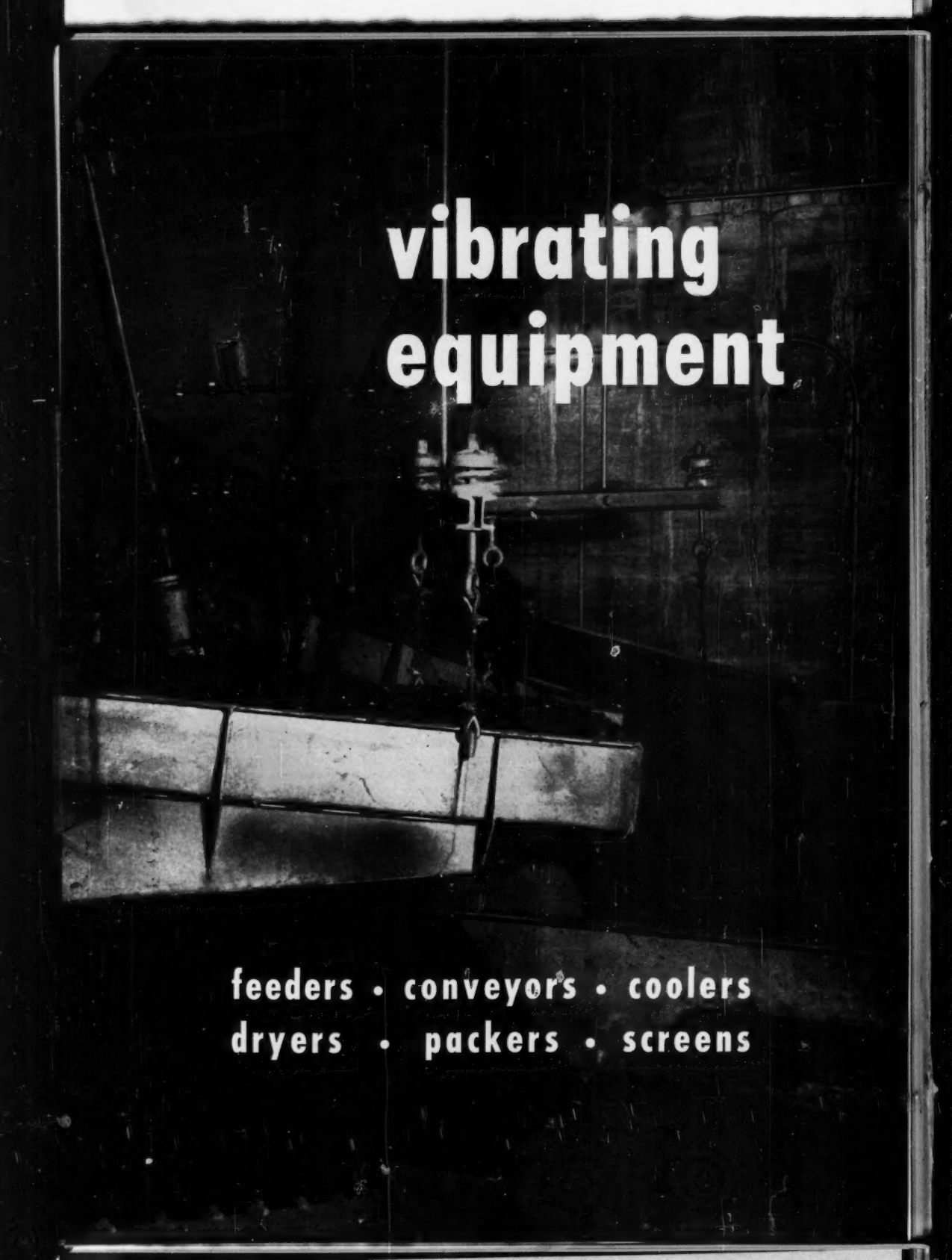
City.....Zone.....State.....

KOPPERS BITUMASTIC PROTECTIVE COATINGS

SOLD THROUGH INDUSTRIAL DISTRIBUTORS

KOPPERS COMPANY, INC., Tar Products Division, Dept. 759-T, Pittsburgh 19, Pa.

DISTRICT OFFICES: BOSTON, CHICAGO, LOS ANGELES, NEW YORK, PITTSBURGH, AND WOODWARD, ALA.


vibrating
equipment
feeders • conveyors • coolers
dryers • packers • screens

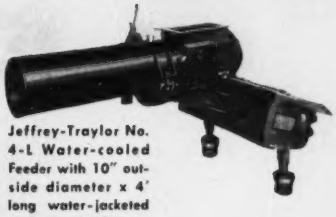
No. 1-B electric vibrating Feeder—for small-capacity operations up to 3500 pounds per hour. Ideal for laboratory use.

A TYPE AND SIZE TO MEET REQUIREMENTS IN CONTINUOUS PROCESSING at Low Overall Cost.

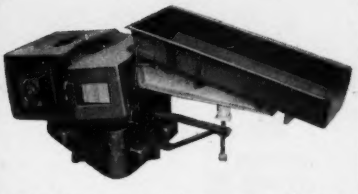
Absolute control over flow of wide variety of materials.

ULTIMATE IN FLEXIBILITY

Literature Available

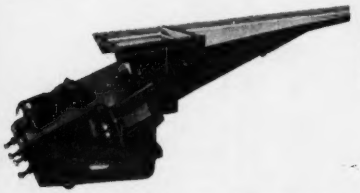


Jeffrey-Traylor No. 4-L Water-cooled Feeder with 10" outside diameter x 4' long water-jacketed deck. For feeding to high temperature furnaces or for handling extremely hot materials.

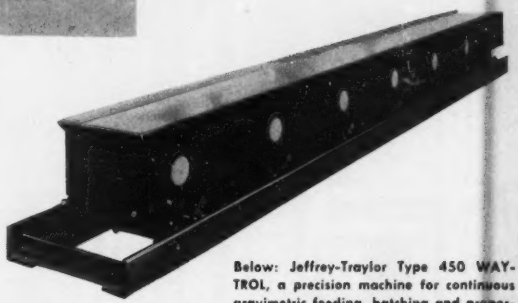


Jeffrey-Traylor No. 3 electric vibrating spark-proof Feeder with 12" x 30" open-pan deck. For feeding operations in hazardous atmospheres or under extreme moisture conditions.

M-V Mechanical Vibrating Conveyor for conveying abrasive, lumpy or rough materials, hot or cold, dry or wet, as well as fine materials. Up to 80' can be operated by one drive unit.

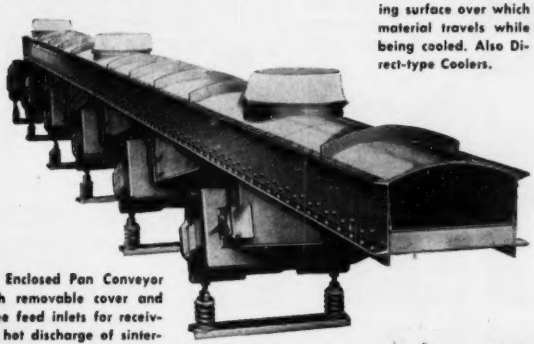


Jeffrey-Traylor electric vibrating Spreader Feeder, 14" wide x 70" long with one edge tapered to spread to 55" width.

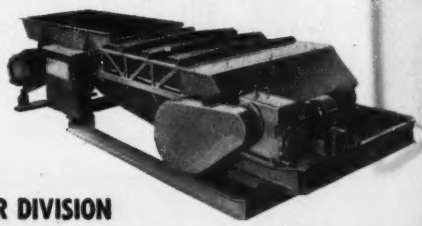


Right: Jeffrey-Traylor electric vibrating Indirect-type Cooler. Type HI-21F open type 21" wide and 18' long. Has solid plate conveying surface over which material travels while being cooled. Also Direct-type Coolers.

Below: Jeffrey-Traylor Type 450 WAY-TROL, a precision machine for continuous gravimetric feeding, batching and proportioning. The feeder is weight-controlled, delivery of material being automatically regulated. Accurate and flexible.



J-T Enclosed Pan Conveyor with removable cover and three feed inlets for receiving hot discharge of sintering machines. A No. 5 electric vibrating type, 25" wide x 45' long.



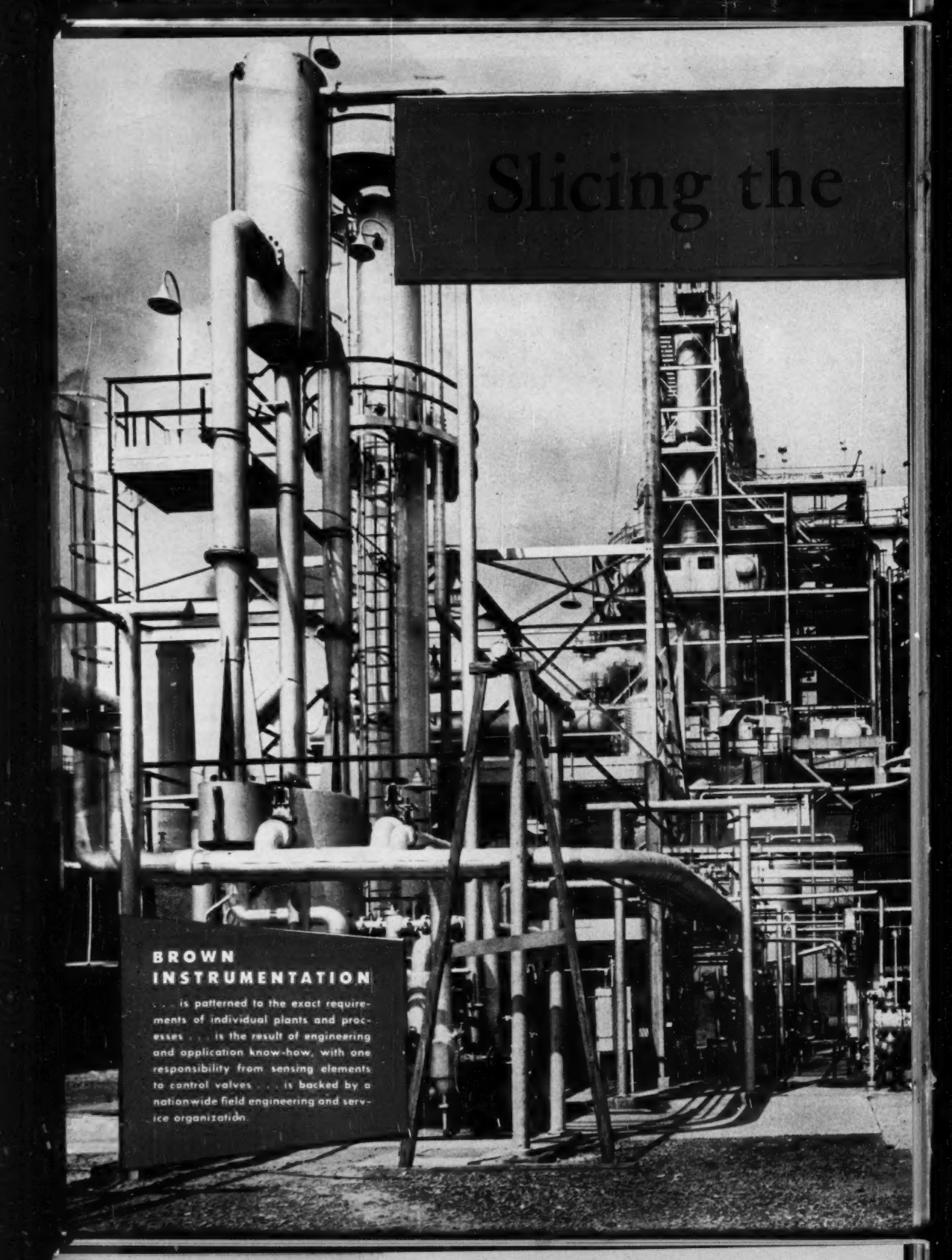
JEFFREY-TRAYLOR DIVISION

CAPACITIES—FROM A FEW OUNCES TO TWO THOUSAND TONS PER HOUR

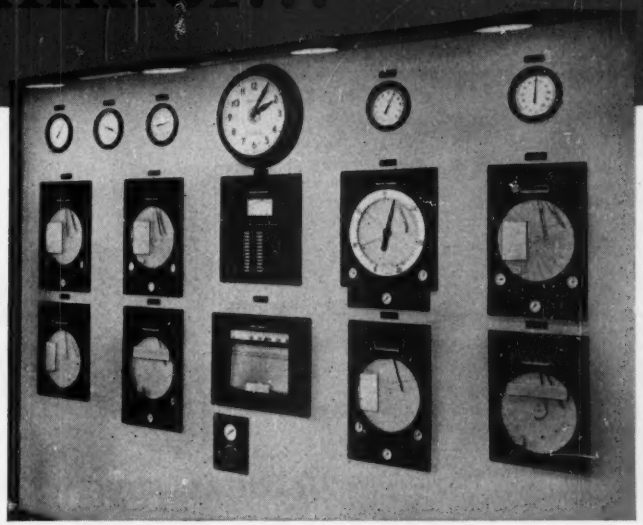
THE JEFFREY MANUFACTURING COMPANY

1877 75 1952

4 North Fourth St., Columbus 16, Ohio


Slicing the
BROWN
INSTRUMENTATION
. . . is patterned to the exact requirements of individual plants and processes . . . is the result of engineering and application know-how, with one responsibility from sensing elements to control valves . . . is backed by a nationwide field engineering and service organization.

cuts thinner...



Deethanizing unit for fractionation of liquefied petroleum gas at Sinclair Refining Co. is regulated by Brown Instruments (at right) on factory-assembled panelboard.

with the help of Brown Advanced Instrumentation

ACCURATE, coordinated control of fractionation is proving the key to economical separation and purification of chemicals, and to the efficient recovery of light ends of petroleum for conversion to liquid petroleum gas and petrochemicals.

Typical of modern fractionation is the LPG plant of the Sinclair Refining Company at Marcus Hook, Pa. Here as in thousands of operations throughout the world, Brown Instruments measure, record and control every variable critical to process efficiency . . . holding each in line with the precision essential to top output and quality.

When you're looking for automatic recording and controlling instruments for your fractionating operation, or *any other process, consider first:*

- The Brown know-how developed through many years of application experience in the industry.
- The completeness of the Brown line—recorders, controllers, panelboards, valves and accessories.

For a detailed discussion of your process requirements, call in our local engineering representative . . . he is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4478 Wayne Ave., Philadelphia 44, Pa.

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls

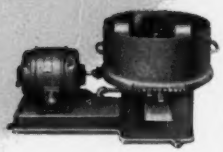
● *Important Reference Data*

Write for Composite Catalog No. 5000 describing the principal Honeywell instruments for process industries.

SIMPSON *MIX-MULLERS*

No. 00 Mixer—24" pan dia.
1½ hp—1200 rpm
¼ to ½ cu. ft. capacity

No. 0 Mixer—3' pan dia.
5 hp—1200 rpm
1 to 1½ cu. ft. capacity



Laboratory Mixer—24" pan dia.
1½ hp—1200 rpm
¼ to ½ cu. ft. capacity

12 BASIC MODELS

Laboratory Mixer—18" pan dia.
¾ hp—1800 rpm
1/10 to ⅛ cu. ft. capacity

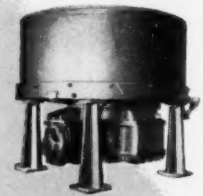
EACH ASSURING FASTER, MORE ACCURATE *MULLING* OF DRY, SEMI-DRY, AND PASTY MATERIALS

SIMPSON Mix-Mullers are built in 12 basic models to fit practically every mixing requirement. Having a capacity range of from 1/10 to 60 cu. ft., each of these models can be equipped for mixing under pressure or vacuum—for heating or cooling—for mixing corrosive materials—or to function as a reaction vessel as well as a mixer.

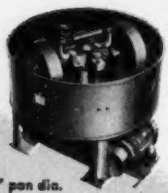
Each model incorporates the *true mulling principle* that has proved so successful throughout the chemical process industries—wherever accurate, controlled mixing and blending of materials is a necessity. The simple rugged design assures low operating and maintenance costs, as well as rapid mixing with a minimum of horsepower consumption per ton of material mixed. The accurate control afforded by batch mixing in a Simpson Mix-Muller is readily adapted to continuous systems.

FOR PROOF of the ability of Simpson Mix-Mullers to do a *better, faster* job in mulling your material—investigate our FREE LABORATORY SERVICE.

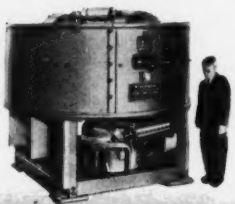
No. 2 Mixer—6' pan dia.
15, 20 or 25 hp—1200 or 1800 rpm
12 to 15 cu. ft. capacity



No. 3 Mixer—8' pan dia.
40 or 50 hp—1800 rpm
25 to 30 cu. ft. capacity

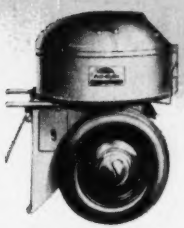


New No. 2F Mixer—6' 8" pan dia.
25 to 30 hp—1800 rpm
30 cu. ft. capacity
(Note adjustable muller design)



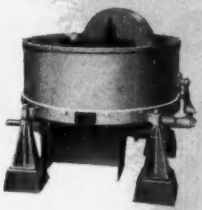
New No. 3F Mixer—8' 4" pan dia.
60 to 75 hp—1800 rpm
60 cu. ft. capacity
(Note adjustable muller design)

MEET *EVERY* PRODUCTION SCHEDULE



Porto-Muller (100% Portable)
3' 3" pan dia.—3 hp—1800 rpm
2½ to 3 cu. ft. capacity

Proven Chemical Process Applications From *Abrasives* to *Zirconia*

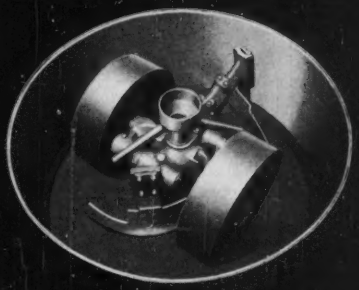


No. 1 Mixer—4' pan dia.
5 and 7½ hp.—1800 rpm
3 to 4 cu. ft. capacity

Abrasives • Adhesives • Aluminum Flux • Artificial Stone • Asbestos Insulators • Asphalt Products • Battery Paste • Carbon Products • Catalysts • Crucibles • Detergents • Dye and Bleaching Powders • Glass Batching • Grease • Graphite • Insecticides • Nickel Oxide • Paper Coatings • Pharmaceuticals • Plaster • Plastics • Putty • Refractories • Roofing Granules • Rubber Compounds • Soap • Synthetic Fuels • Titanium Dioxide • Water Treatment Compounds • Welding Rod Electrodes • Wood Fibers • Zirconia

No. 1H Mixer (Semi-Portable)
4' pan dia.—7½ hp—1800 rpm
4 cu. ft. capacity

No. 1½ Mixer—4½' pan dia.
7½ or 10 hp—1200 and 1800 rpm
5 to 6 cu. ft. capacity



DO YOU REALLY KNOW WHAT MULLING IS?

WATCH the practiced technique of the chemist's mortar and pestle — the intensive smearing and rubbing action —and basically, *THAT'S MULLING!*

Simpson Mix-Mullers re-create this action with a special pair of revolving mullers and plows, mounted in a stationary pan. The mullers are supported by rocker arms to assure the *correct* pressure on the material in preparation, without grinding.

Results in thousands of applications show the *elimination* of balling and a *maximum* . . . intimate blending of material in a *minimum* amount of time. Because of this intimate blending, materials prepared in the Simpson Mix-Muller are not subject to segregation while in storage or transit.

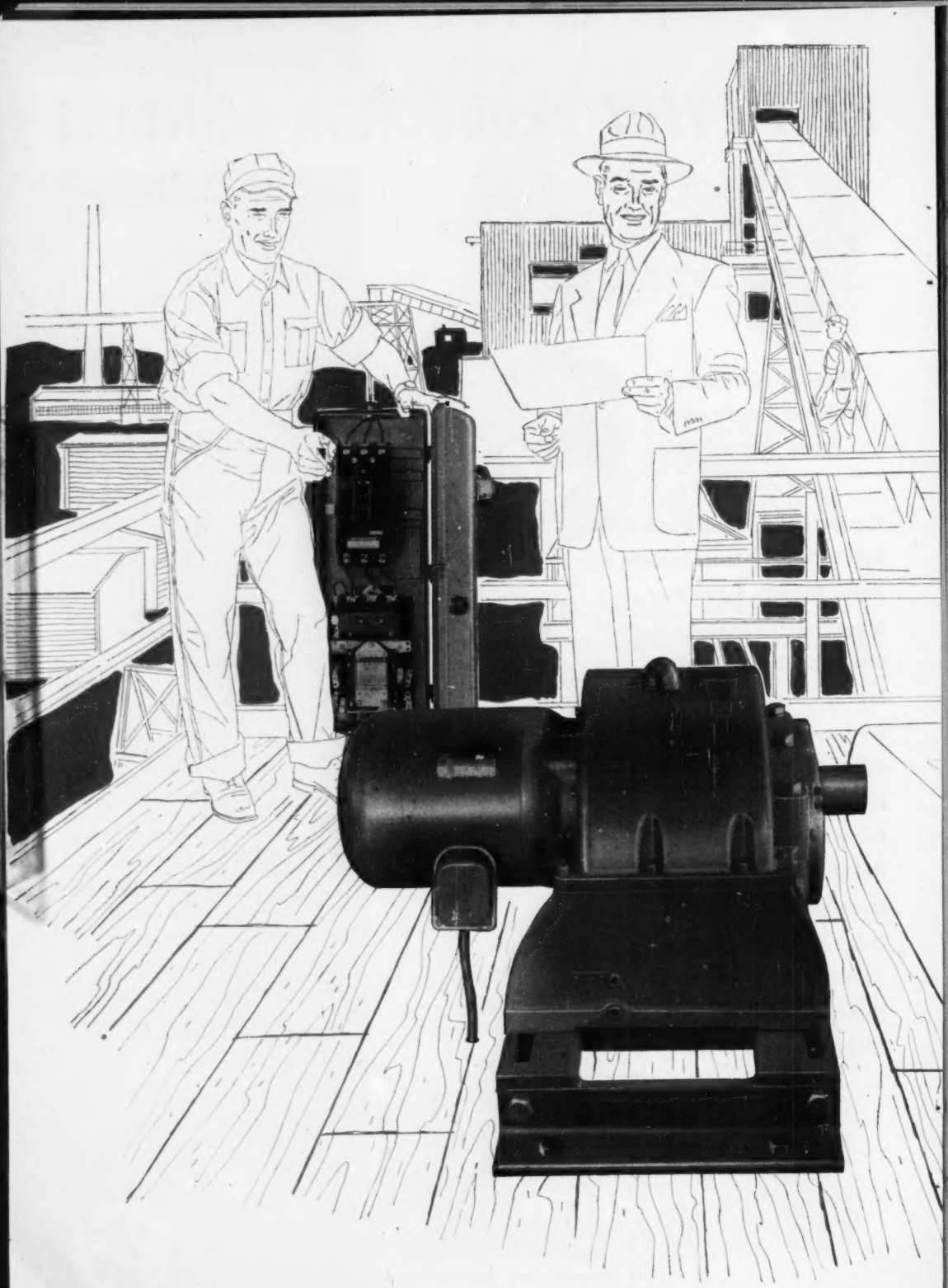
LABORATORY SERVICE

We have a completely equipped modern testing laboratory for determining the results of mulling your materials in Simpson Mix-Mullers. A confidential test in our laboratory will prove what a Simpson can do for you. *Write for details.*

SIMPSON Mix-Muller Division

[illegible] 624 So. Michigan Blvd., Chicago 6, Illinois

See Mulling Demonstrated in Booths 233-234 at the 1952 Chemical Exposition Chicago—September 9-15



"We can service this Drive Team faster

because all parts are more accessible"

"I'm the fellow who has to live with the gearmotors and controls that we purchase. That's why I'm interested in what it takes to get at the *working parts.* I don't want equipment that only a contortionist could service.

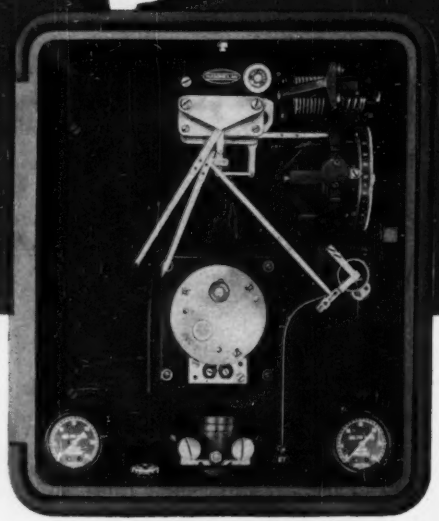
"Take a look at this Westinghouse Combination Life-Linestarter. It offers both circuit and motor protection all in one enclosure. Every screw can be reached from the front—every part can be removed from the front. This saves me considerable time and effort when I have to service the device or change a heater. Installing these starters is simpler too, thanks to the straight-through wiring and pressure-type connectors. I don't have to guess at wire lengths or hunt for terminals.

"Now look at this Westinghouse Life-Line Gearmotor. The split-case construction really is the answer to getting at the working parts. The upper-half case is easily removed for inspecting gears and bearings. I don't have to disturb the alignment or drain the oil. Removing the motor is a cinch. And look! There is no shimming or motor coupling to realign.

"We've found it's easier to live with our drives when we specify Life-Line Gearmotors and Life-Linestarters." You can do the same. Just call your local Westinghouse representative for full details, or write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-07304

So You Want to Buy a

Of course you'll compare the various models offered. You will note that:—



All have the same basic components . . .
primary element, proportioning mechanism, pilot.

All operate on same basic principle . . .
measure changes in controlled variable, apply corrective measures by regulating an output pressure.

BUT HERE THE DIFFERENCES BEGIN

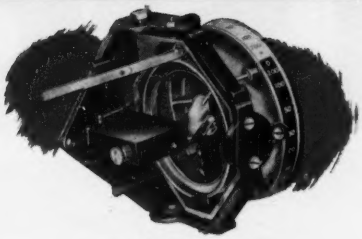
differences that are important to the instrument man and operator: differences in design and arrangement which result in great variations in simplicity, versatility, reliability and ease of adjustment and servicing.

For example, note how refinements in design make the Masoneilan 60000 Series Controller outstandingly different from most other types —

A HIGH Co PRODUCT

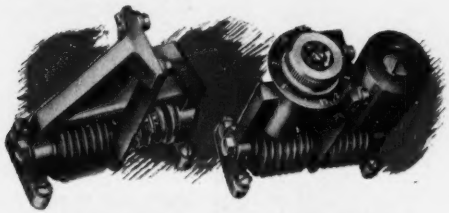
SEE THEM AT THE INSTRUMENT SHOW . . . BOOTHS 435-439

Pneumatic Controller!



THE GIMBAL UNIT...

the heart of the mechanism which regulates the flow of power from the controller — selects *four* combinations of primary and feedback motion to provide proportional, differential-gap and on-off control with direct or reverse action — makes this controller more versatile than any other. The proportional band wheel, by one simple adjustment, selects the *type* of control, the *action* and the proportional band or differential-gap *setting*.

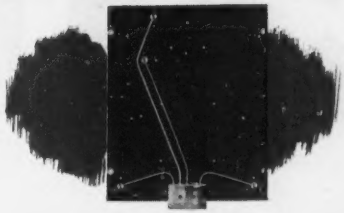


INDIVIDUAL, INTERCHANGEABLE SUBASSEMBLIES...

without linkage complexities, provide for (a) addition of standard subassemblies *easily*, to obtain pneumatic set, time schedule, differential control; (b) *easy* interchange of standard proportional and proportional-rest units; (c) ease of servicing because each sub-assembly is *individually* accessible.

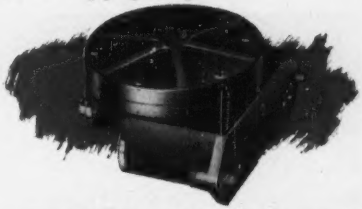
EASE OF ADJUSTMENT...

provided by accessibility without removing chart; by large knobs and large diameter proportional band wheel; by easily read graduated scales.



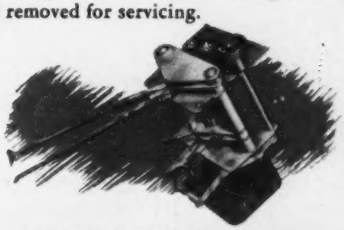
MANIFOLDING OF ALL AIR PASSAGES

with plug-in connections (a) aids accessibility, (b) eliminates pressure fittings, (c) permits interchange of components or addition of manual control subpanel *without piping changes.*



BALANCED, AMPLIFYING PILOT...

insures maximum capacity and stability in flow of output pressure. Includes latest refinements such as plunger-cleaned sapphire restriction, filters in outlet and inlet ports, frictionless floating valve action. Easily removed for servicing.



MULTIPLE PEN MOVEMENT...

provides common axis of rotation for pens and index, ball pivots, index setting by manual or automatic (e.g., Pneumatic Set, Time Schedule, etc.) adjustment.

With accurate, stable performance plus unmatched simplicity, versatility and reliability — the Masoneilan 60000 Series Controller is truly the Instrument Man's Instrument for pressure, temperature, liquid level or flow control.

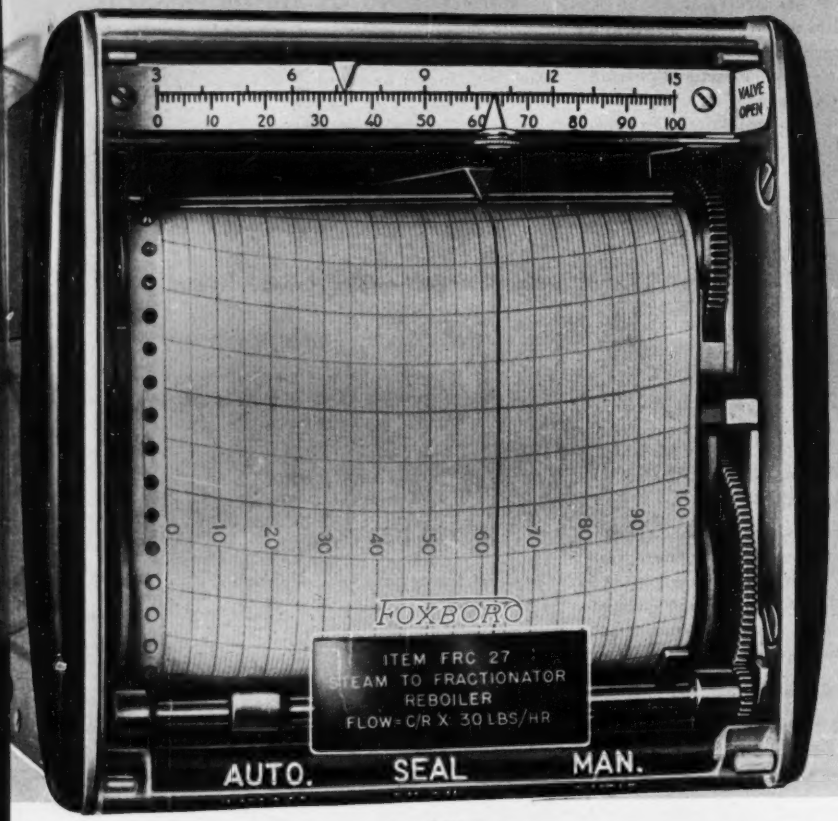
MASON-NEILAN REGULATOR CO.

1197 ADAMS STREET, BOSTON 24, MASS., U. S. A.

Sales Offices or Distributors in the Following Cities:
New York • Syracuse • Chicago • St. Louis
Tulsa • Philadelphia • Houston • Pittsburgh
Birmingham • Atlanta • Cleveland • Cincinnati
Detroit • San Francisco • Salt Lake City • El Paso • Boise • Albuquerque • Charlotte • Los Angeles • Denver
Appleton • Corpus Christi • New Orleans • Louisville • Mason-Neilan Regulator Co., Ltd., Montreal and Toronto

Graphic Panel Instrumentation

CONSO



NEW M/53 CONSOTROL RECORDER PROVIDES 4 BETTER RECORDING-CONTROLLING SYSTEMS...

- **FULL-SCALE CHARTS** — Full 4" scale length. 30-day strip chart. Five hours of record always visible.
- **SINGLE SWITCH AUTOMATIC-MANUAL TRANSFER**
- **NO SET KNOBS** — All settings lever-operated.
- **CONTINUOUS VALVE-POSITION INDICATOR**
- **POSITIVE CONTROL SET-POINT** — Cannot drift. Maintained by precision pressure transmitter.
- **SECOND PEN OPTIONAL** — for extra non-controlled variable without compromising other features.

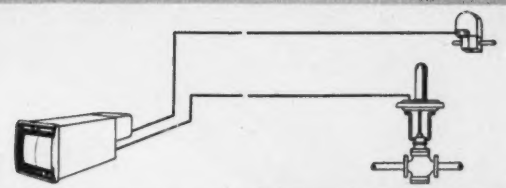
Single and 2-pen recorders, without control features, also available.

"comes of age"... in

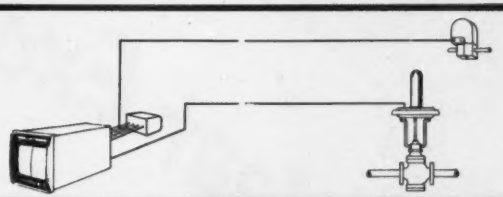
TROL

Recording-Controlling INSTRUMENTS

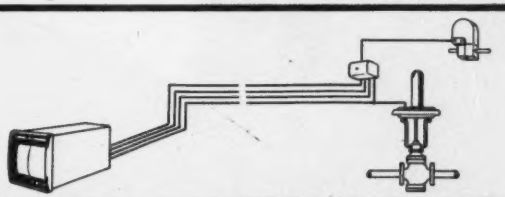
1 **Consotrol Recorder with M/58 Consotrol Controller... integrally-mounted**



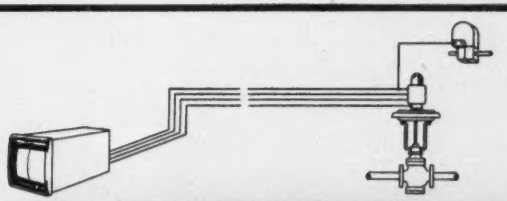
2 **Consotrol Recorder with M/58 Consotrol Controller... rack-mounted**



3 **Consotrol Recorder with M/58 Consotrol Controller... field-mounted**



4 **Consotrol Recorder with valve-mounted M/59 Consotrol Controller.**



New in concept . . . new in principle . . . Foxboro Consotrol Instruments combine amazing new convenience and accuracy with extreme compactness. Their simplicity and flexibility permit users to apply them to virtually any modern process requirement!

The unique versatility of the new Consotrol M/53 Recorder is outlined on these pages. Write for new Bulletin 463 containing details of the complete Consotrol line . . . recorders, "blind" receiver-controllers and indicating receiver-controllers.

The Foxboro Company, 367 Neponset Ave., Foxboro, Mass., U.S.A.

FOXBORO

REG. U. S. PAT. OFF.

INSTRUMENTS

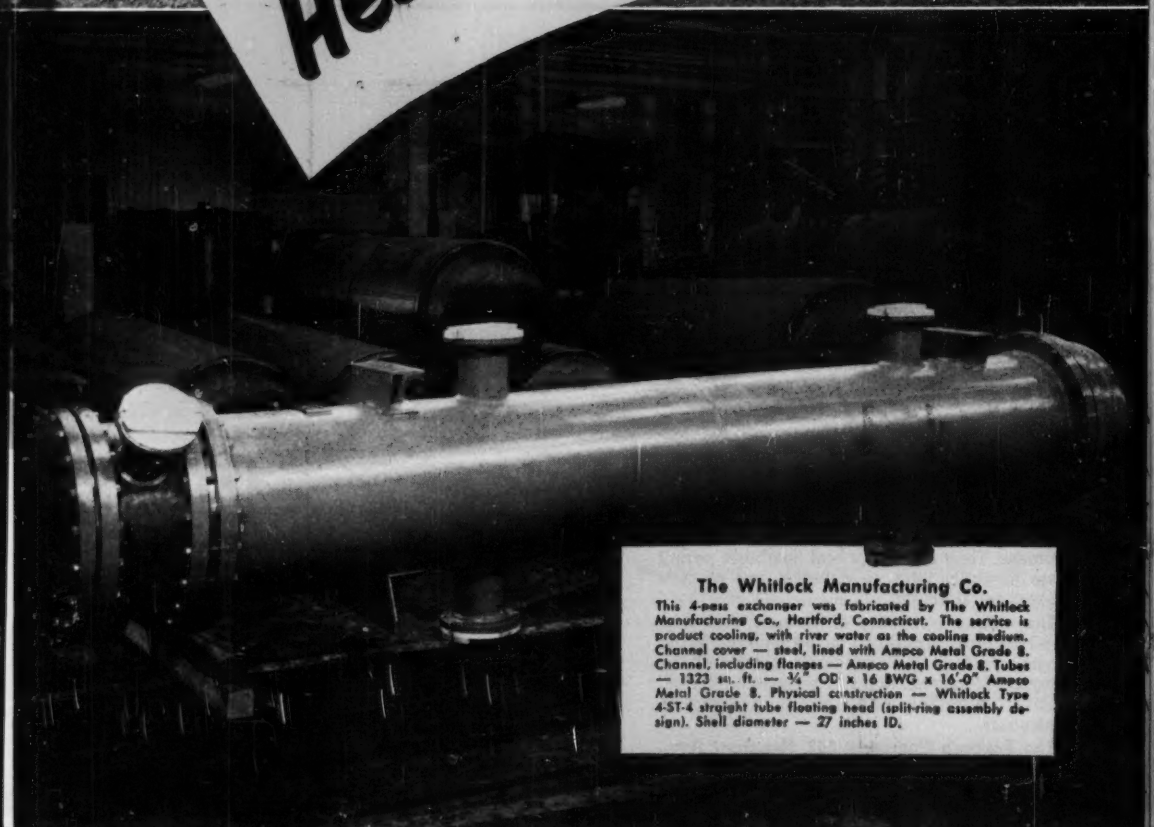
Recording · Controlling · Indicating

T fittings and flange

Heat Exchangers of

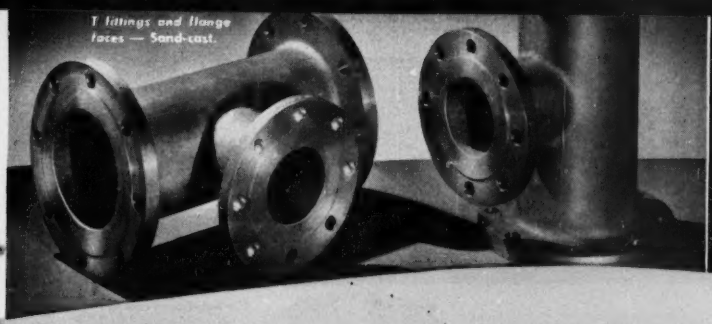
Downington Iron Works, Inc.

These two exchangers, fabricated by Downington Iron Works, Inc., Downington, Pa., are used in condensing benzene. Ampco Metal Tube sheets are welded to a steel shell and the heads, also made from Ampco Metal, are welded to steel flanges. All welding is done with Ampco-Trode® electrodes. Shell diameter 14". Tube length 10 feet.

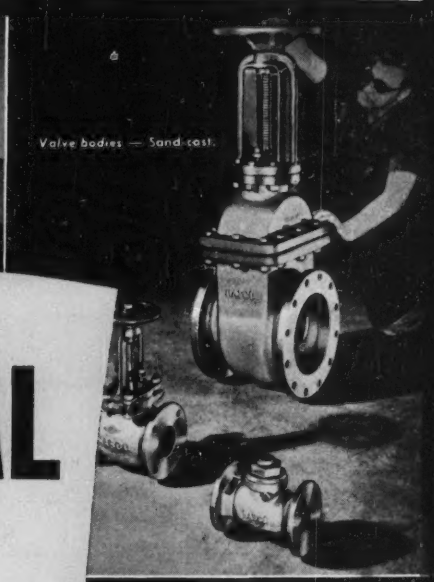


The Whitlock Manufacturing Co.

This 4-pass exchanger was fabricated by The Whitlock Manufacturing Co., Hartford, Connecticut. The service is product cooling, with river water as the cooling medium. Channel cover — steel, lined with Ampco Metal Grade 8. Channel, including flanges — Ampco Metal Grade 8. Tubes — 1323 sq. ft. — ¾" OD x 16 BWG x 16'-0" Ampco Metal Grade 8. Physical construction — Whitlock Type 4-ST-4 straight tube floating head (split-ring assembly design). Shell diameter — 27 inches ID.



T fittings and flange faces — Sand-cast.



Valve bodies — Sand-cast.

AMPCO* METAL

resist corrosion and erosion

YOU can get better service from your heat exchangers, when you use Ampco Metal for those parts that are subjected to attack by corrosion or erosion.

But heat exchangers are not the only application for Ampco Metal. You find it used in many places in the process industries and in marine service as well . . . for tanks, pipe, separators, bubble caps, fractionating towers, stills, condenser water boxes, agitators, etc. — wherever you need high resistance to corrosion and erosion.

Ampco Metal Grade 8, one of the Ampco series of engineered aluminum bronze alloys, is Boiler Code approved for unfired pressure vessels. In addition, you get these unique properties: high resistance to corrosion . . . high tensile (75,000 psi) . . . high physicals at extreme temperatures . . . high strength to weight ratio . . . high impact and fatigue values (Charpy @-423° F., 93 ft. lbs.; @ 70° F., 75 ft. lbs.; fatigue limit 28,000 lbs. @ 100,000,000 cycles) . . . high resistance to wear from erosion, abrasion, cavitation pitting . . . high compressive strength (E. L. in Comp. 25,000 psi) . . . high modulus of elasticity (18,000,000).

Moreover, Ampco Metal Grade 8 is easy to fabricate with Ampco-Trode* welding wire, rods, or covered electrodes. And, Ampco Metal Grade 8 is available in a variety of forms — sheet, plate, extrusions, pipe, tubes, fasteners, etc. Since it is the answer to many problems, it may help you. Consult your nearest Ampco Field Engineer or write us for further information.

Fabricating Ampco Metal with Inert Gas Consumable Electrode welding.

Mail this coupon today!

*Reg. U. S. Pat. Off. Ampco Metal, Inc., Milwaukee, Wisconsin

Ampco Metal, Inc.

AMPCO

MILWAUKEE 46, WISCONSIN

West Coast Plant —

BURBANK, CALIFORNIA

AMPCO METAL, INC., Dept. CE-7, Milwaukee 46, Wisconsin

Send me information on the application of Ampco Aluminum Bronzes for corrosion-resistant service in the Process Industries.

Name..... Title.....

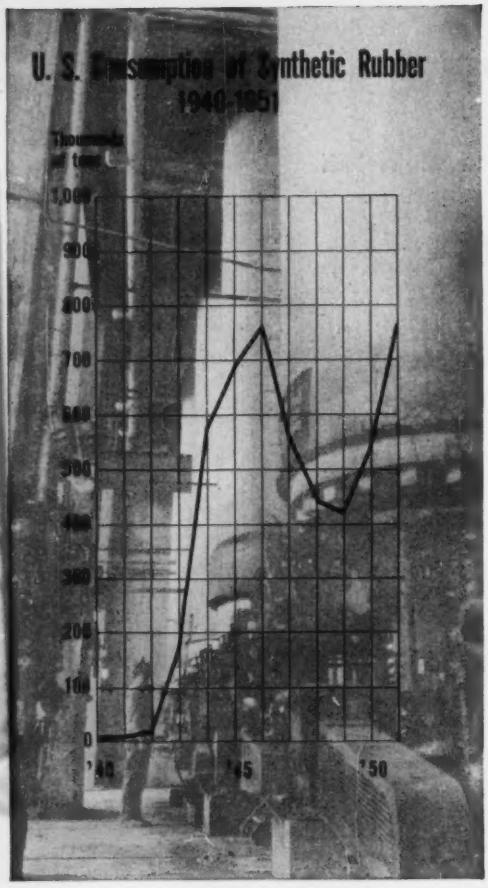
Company.....

Company Address.....

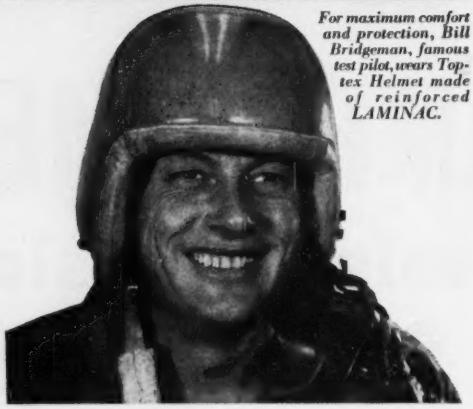
City..... (.....) State.....

PM-9

Life ... on the



GROWTH OF THE SYNTHETIC RUBBER INDUSTRY has been the most important single development in the rubber field during the past fifty years. Cyanamid's pioneering development and manufacture of acrylonitrile as a base chemical for synthetic rubber is an outstanding example of the way Cyanamid continues to pace new industrial developments through chemistry. Acrylonitrile-butadiene rubber can be made with a wide variety of properties and is used in the making of many and varied types of rubber articles. Cyanamid is expanding its acrylonitrile facilities by building a new plant in Louisiana to manufacture this important chemical from natural gas. Acrylonitrile is but one of a whole group of Cyanamid chemicals including ANTI-OXIDANT* 2246, PEPTON® 22 Plasticizer, accelerators, retarders and pigments, that help the rubber industry to produce better and more durable products. *Trade-mark



For maximum comfort and protection, Bill Bridgeman, famous test pilot, wears Toptex Helmet made of reinforced LAMINAC.

PLASTICS are a segment of the chemical industry which has shown a most striking growth in the last few decades. Cyanamid pioneered with three types, all thermosetting. Starting with BEETLE® Urea Resins in the late 20's, the company went on to develop its MELMAC® Melamine Resins in the late 30's. With these materials, a complete range of colors was made available for the first time in a thermosetting plastic. In the early 40's the company introduced LAMINAC® Polyester Resins which also represented a notable advance, since they can be cured with or without heat and pressure. The growth of this type of plastic alone is indicated by a report from Republic Aviation: whereas this type of plastic was used in only 5 parts per plane in World War II, today's F-84 jet contains 225.

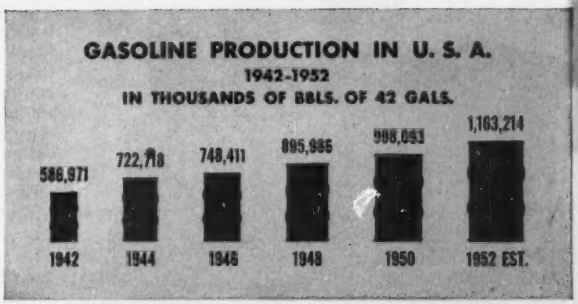
Courtesy of Western Machinery Company

FROTH FLOTATION OF ORES, throughout its almost fifty-year history, has never been more important as a process for the concentration of ores than it is today. Depletion of high-grade ores and the increasing need for metals from rare ores make froth flotation research at Cyanamid's Stamford Research Laboratories a vital service to the minerals industry. Laboratory development of AEROFLOAT® Reagents and new flotation processes by Cyanamid have helped Cyanamid keep ahead of new mining developments. For the first time in history, commercial froth flotation of iron ores will become a fact during the coming year to add to our strategic domestic iron ore reserves.

Chemical Newsfront

NEW STORAGE AND BLENDING FACILITIES FOR PHOSPHATE ROCK at Cyanamid's Brewster, Florida, plant indicate the increasing importance of this basic chemical to agriculture and industry. Begun in 1868, phosphate rock mining in the United States has been geared to the continually rising demands of agriculture; now produces over 9,000,000 tons a year. The new rotary stacker-conveyor shown expands Cyanamid's storage capacity, permits more accurate blending of phosphate rock for the fertilizer and chemical industries. Blending is done on underground conveyors directly beneath semi-circular piles. The blended rock is then conveyed into the plant for drying and shipping. This is but one of many products developed by Cyanamid for the care and improvement of our land and the protection of its crops and livestock.

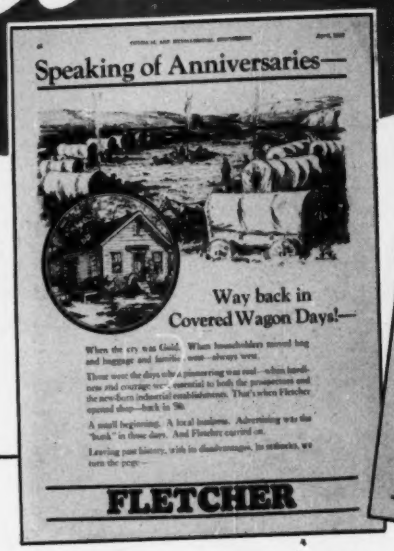
U. S. GASOLINE PRODUCTION has increased steadily since 1942, the year Cyanamid began commercial production of AEROCAT® Synthetic Fluid Cracking Catalysts. To further the nation's civilian and military production of high-octane motor fuels, Cyanamid is expanding its production of MS Catalyst at its Fort Worth, Texas, and Michigan City, Indiana, plants to a level sufficient for approximately 1,000,000 barrels daily of refining capacity. Cyanamid, as the first producer of microspheroidal synthetic fluid cracking catalysts, has constantly offered the widest range of grades to suit any petroleum refining unit.

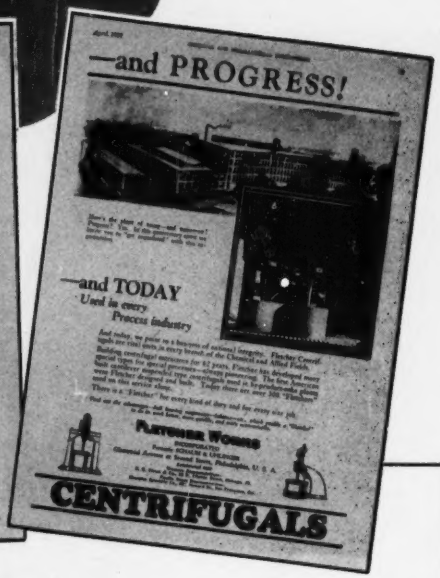


AMERICAN Cyanamid COMPANY
30 ROCKEFELLER PLAZA | NEW YORK 20, N. Y.

Fletcher

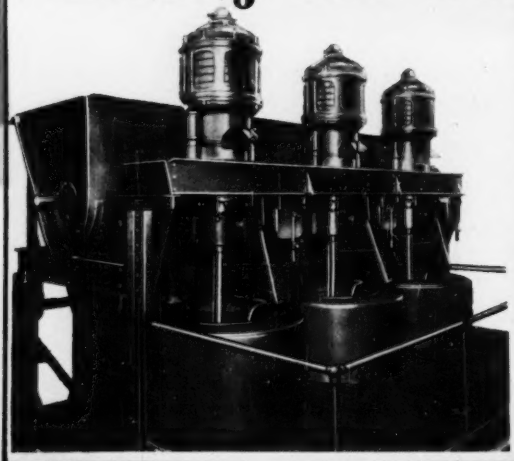
Twenty-five years ago our advertising, shown at right, stressed Fletcher's aim to provide the finest in centrifugal construction. That aim is still paramount with us today.





Blazing New Trails

FOR OVER A CENTURY



The Chemical Industry long has been in the forefront in contributing toward man's better living. Many of the advancements have been aided by the continued improvements made in productive equipment. Fletcher is proud, indeed, of the part we have played in this . . . in producing a line of centrifugals which, through steady research and design improvements, meets the industry's current needs for economical efficient and dependable Filtering, Separating, Extracting, Dehydrating or Clarifying Processes.

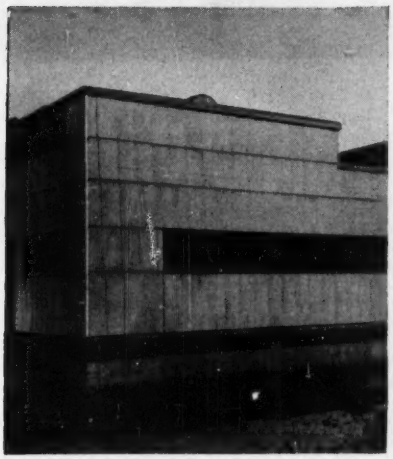
This book "Fletcher Centrifugals for the Chemical Industries" shows the many Fletcher design and construction advantages. Write for a copy or have our engineers consult with you on your problems.

FLETCHER WORKS

235 GLENWOOD AVE. PHILADELPHIA 40, PA. ESTABLISHED 1850

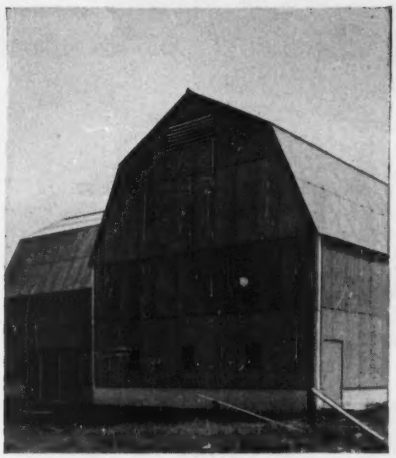
CORRUGATED *Asbestos* TRANSITE*

FOR THE FACTORY



Because it is practically indestructible, Johns-Manville Corrugated Transite is extensively used in this plant to provide a durable, trouble-free exterior.

FOR THE FARM



This large barn is typical of the excellent use of Johns-Manville Corrugated Transite on farms where it helps eliminate the threat of loss from fire, destructive rot, and vermin.

You build economically and quickly with these versatile fireproof and weatherproof asbestos building sheets

In the past quarter century, Johns-Manville Corrugated Transite has proven an ideal material for roofs and for sidewalls of industrial, commercial, institutional and agricultural buildings. Made of asbestos and cement, the large sheets are easy to handle, go up quickly with a minimum of framing. Practically indestructible, Corrugated Transite is fireproof, rotproof, weatherproof; needs no paint or special treatment to preserve it; and can be salvaged and re-used if necessary.

The streamlined corrugations and attractive shadow lines of J-M Corrugated Transite have great architectural appeal . . . creating a contemporary effect in keeping with today's growing requirements for functional beauty inside as well as out.

Investigate J-M Corrugated Asbestos Transite and learn how you can build quickly and easily . . . have an attractive, long-lasting, trouble-free structure regardless of size or purpose. For complete details write Johns-Manville, Box 158, Dept. CE, New York 16, N.Y. In Canada write 199 Bay Street, Toronto, Ontario.

*Reg. U.S. Pat. Off.

EASY TO FASTEN TO STEEL

EASY TO SAW

EASY TO DRILL

EASY TO NAIL TO WOOD

JM

Johns-Manville *Asbestos* CORRUGATED TRANSITE

65 Years' Progress

1887 AIR SEPARATION

1888 AUTOMATIC PULVERIZERS

1895 ROLLER MILLS

1905 ADJUSTABLE DEFLECTOR AIR SEPARATORS

1919 PNEUMATIC FEED CONTROL

1922 IMP PULVERIZERS

1924 SUPER ROLLER MILLS

1926 KILN MILLS

1928 MECHANICAL AIR SEPARATORS

1933 WHIZZER-EQUIPPED ROLLER MILLS

1934 FLASH DRYING SYSTEM

1935 BOWL MILLS

1941 VERTICAL MILLS

1949 SUPER MECHANICAL AIR SEPARATORS

THE Raymond story of leadership through the years is marked by many milestones of progress in the development of pulverizing and air separating machinery.

The air separation principle, pioneered by Raymond in 1887, was successfully applied to grinding mills, superseding the old-time screens and bolting cloths with the modern method of air classification.

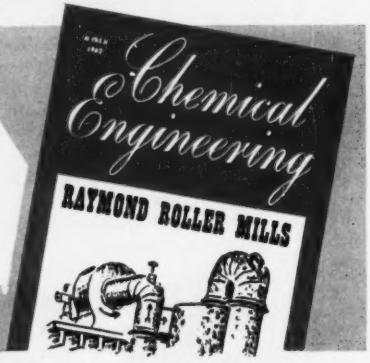
Raymond was first to build Super Roller Mills for handling huge capacities up to 40 tons per hour of finely ground material. The Bowl Mill was another achievement that brought new efficiency in coal pulverizing and kiln firing.

The Flash Drying System made it possible to equip Raymond Mills and Pulverizers so as to combine both the drying and grinding operations into one continuous process with a single unit of equipment.

By means of the Vertical Mill and Whizzer Separation, Raymond has given industry a new concept of high fineness pulverizing, beyond the range of ordinary mills.

Raymond Pulverizer Division is an old company with new ideas, using its wealth of experience to improve the value of its products. It offers an engineering service qualified to handle any problem in the production of powdered materials for the chemical and processing industries.

46 YEARS AGO the first Raymond advertisement appeared in November Chemical Engineering, (then: "Electrochemical Industry"). Raymond is one of the oldest continuous advertisers in C-E since 1906.



COMBUSTION ENGINEERING

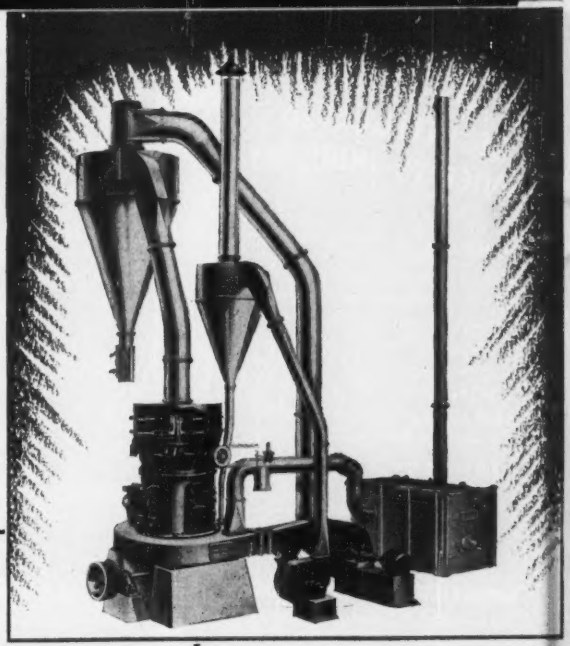
Refer your drying, grinding and separating problems to Raymond engineers to insure the proper equipment for your job.

Raymond
PULVERIZER DIVISION

in PULVERIZING

LATEST TYPE
Raymond Roller Mill

equipped with Air Separation, Flash Drying and Pneumatic Feed Control . . . for handling material automatically from feed hopper to finish bin . . . for removing moisture and pulverizing the product in one operation.



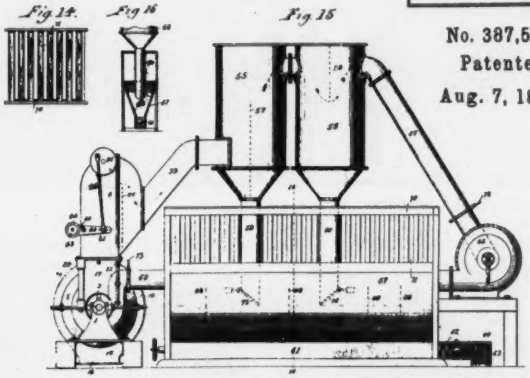
EARLIEST TYPE
Raymond "Reducing Machine"

The beginning of 65 years of progress

ORIGINAL RAYMOND PATENT

G. & A. RAYMOND.

REDUCING MACHINE.



No. 387,539.
Patented
Aug. 7, 1888.

SINCE 1887

—SUPERHEATER, INC.

1311 North Branch St., Chicago 22, Illinois
Sales Offices in Principal Cities

RAYMOND BOOTH #170

seventh national chemical exposition
chicago coliseum september 9-13
see our exhibit

TREADWELL

MERCURY-CELL CHLORINE PLANTS...

57 YEARS OF INTEGRATED SERVICE TO INDUSTRY

ENGINEERING:

Treadwell maintains a comprehensive engineering service for the design of—

1. Complete plants for the chemical industry, for ore beneficiation, for pre sintering, for non-ferrous smelting and refining.
2. Buildings and other structures for a wide range of industries.
3. Equipment and machinery to meet your requirements.
4. Material handling systems for ore, coal and other bulk materials.
5. Studies, estimates and reports.

FABRICATION and MANUFACTURE:

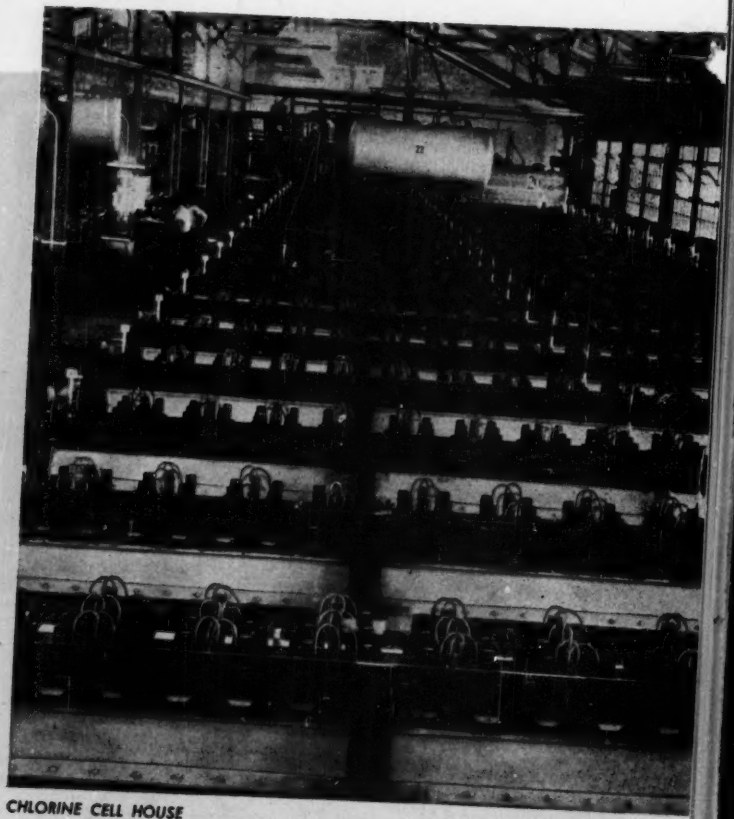
The Treadwell line of processing equipment includes—

- Absorbers
- Agitators
- Autoclaves
- Crystallizers
- Digestors
- Evaporators
- Fractionating Towers
- Kettles
- Nitrators
- Pressure Vessels
- Scrubbers
- Separators
- Sulfonators
- Tanks, for all purposes

Where you prefer, the above equipment, as well as a long list of other processing units, can be fabricated from your drawings.

CONSTRUCTION:

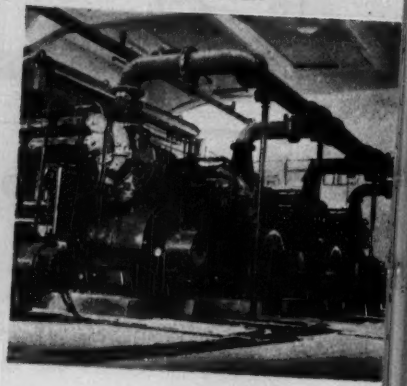
The Treadwell organization is prepared to act as general contractors or to provide a complete service of design, fabrication and erection for a wide variety of process, metallurgical and power plant equipment.



CHLORINE CELL HOUSE

CARBON BISULFIDE PLANT

DIESEL ELECTRIC INSTALLATION



...*for* TROUBLE-FREE OPERATION AND HIGH-QUALITY PRODUCTS

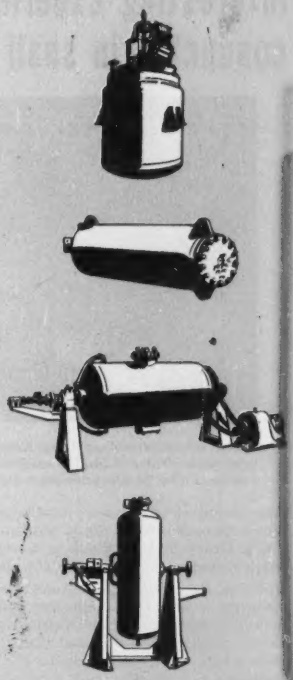
Treadwell mercury cells are unique in that (1) no mechanical devices are used to circulate the mercury, and (2) both the electrolysis compartment and the denuder can be cleaned without interruption of cell operation.

These cells are built in sizes from 1,500 to 30,000 amperes. They are adaptable to all installations from the smallest to the largest.

Treadwell's experience in serving industries which are consumers of chlorine and caustic enables company engineers to design captive plants that are fully integrated with respect to end-use conditions.

THE ELECTROCHEMICAL CONSTRUCTION DIVISION of M. H. Treadwell Co., Inc., builds chlorine-caustic plants (with either its own mercury cells or with diaphragm cells), installations for the production of chlorine products and bleaches, electrolytic hydrogen-oxygen plants, carbon-bisulfide plants, special chemical equipment and installations, electric furnaces for chemical reactions and special electro-chemical installations. The company is also prepared to handle the engineering and construction of chemical plants in cooperation with your process engineers or with licensors both here and abroad.

Send for further information on your specific requirements.

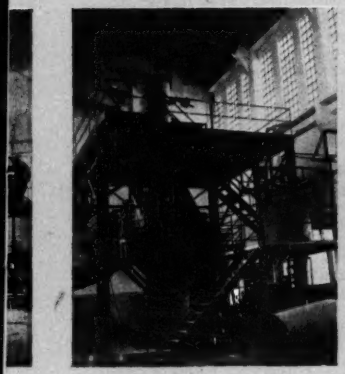


M. H. TREADWELL COMPANY, Inc.

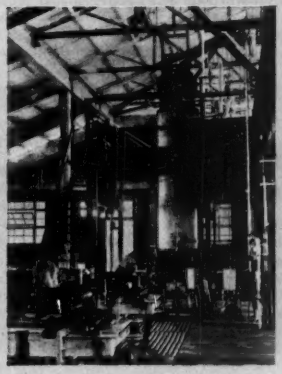
140 CEDAR STREET, NEW YORK 6, N. Y.

Sales Offices in Pittsburgh and Chicago.
Plants in Easton and Midland, Penna.

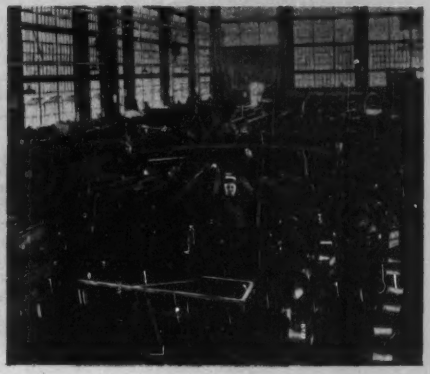
SPECIAL ELECTRIC FURNACE



MURIATIC ACID PLANT



CARBIDE CASTING WHEEL



MONSANTO
CHEMICALS — PLASTICS

Interesting experiments with Santobrite conducted in snail control program

Certain species of snails, although harmless in appearance, act as carriers of parasites which cause schistosomiasis. This specimen, of the *Australorbis glabratus* strain from Brazil, was dead after 24-hour exposure to Santobrite. (Picture by National Institute of Health.)

Experiments with Monsanto's Santobrite* have been conducted by Army, Navy and Public Health Service officials in a campaign to eradicate certain species of snails.

In China, Egypt, Africa, Brazil and other countries, snails act as intermediate hosts for schistosomes, which cause schistosomiasis in humans. It is estimated that 110 million people are afflicted with schistosomiasas, a debilitating and eventually fatal disease. To date, a fully satisfactory treatment for the disease has not been found, thus giving added importance to the snail control project.

World War II gave sudden impetus to the investigation of schistosomiasis. During the invasion of Leyte in the Philippines, 1,700 U. S. troops fell victims of the disease. It is not a rapid killer, but spreads its death slowly by making its sufferer extremely listless. Death takes place as a result of its ravages . . . damage to the intestines, bladder, liver or lungs.

Schistosomiasis cannot be passed directly from one human being to another. Human infection, because of the peculiar life cycle of the parasitic worm which causes the disease, comes almost directly from the all-important snail, through polluted water.

To date, laboratory and field tests indicate, from an economic and performance standpoint, that the most efficient chemical for eradicating snails is Santobrite.

Monsanto's Santobrite is currently being used to control sap-stain in lumber, and slime and algae in industrial cooling waters. It acts as a preservative for many cellulosic products, such as fiberboard and paper, and plywood adhesives.

* * * * * * * * *

Mail the coupon for two new technical bulletins

Bulletin No. O-80—Benzyl Chloride. Gives handling and technical data on benzyl chloride, a cyclic intermediate with applications ranging from pharmaceuticals to rubber accelerators.

Bulletin No. O-81—Santicizer 3.* Describes Santicizer 3, a solid, sulfonamide-type plasticizer especially useful in adhesives and coatings.

Monsanto uses new process in making benzoic acid

In its expanded plant capacity for the manufacture of benzoic acid, Monsanto is employing an entirely new synthesis from basic raw materials. It is the first such process in America. It doubles the company's capacity for making technical and U.S.P. grades of benzoic acid as well as Benthal *

Try this low-cost, efficient plasticizer . . . you can get it now

Monsanto Ortho-Nitrobiphenyl may be employed as a primary plasticizer or extender for industrial-type molded, extruded, plastisol or organosol compounds. ONB is low in price . . . and available.

In vinyls, ONB helps impart resistance to grease and abrasion—may be extended by the addition of petroleum-type plasticizers, further lowering costs. ONB is an excellent plasticizer for glove coatings, window gaskets, general gasketing materials, welting, channeling, machinery supports and protective coatings.

In vinyl acetate adhesives, ONB is a low-cost primary plasticizer. It can be used in high concentrations to retain toughness and adhesion without excessive softening of the film. Its low cost permits the production of economical adhesives for tabbing cements, cardboard box sealing, for bonding acetate film to paper, for overlays or for packages with acetate windows.

In cellulosics, ortho-nitrobiphenyl serves as the plasticizer for such dark-colored products as molded toys, toy gun stocks and similar production. Excellent for reclaimed acetate.

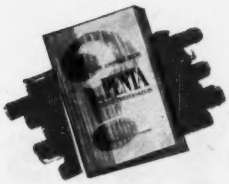
For further information, contact the nearest Monsanto Sales Office or mail the coupon for a copy of Monsanto Technical Bulletin No. O-78.

* * * * * * * * *

ortho-ETHYLNITROBENZENE has interesting reactions

This *low-cost* intermediate and its derivative, ortho-ETHYLANILINE, now are available from Monsanto. They undergo many interesting reactions to yield, for example, indole, ortho-amino and ortho-nitroacetophenone, quinolines, a substituted thiourea, an isocyanate and cinnolines. Technical bulletin and quotation available upon request.

APPROXIMATE PROPERTIES of OENB: Molecular Weight: 151.1 . . . Appearance: Yellow to green, clear liquid . . . Assay: 99-100% (including approx. 4% to 6% para isomer) . . . Boiling Point: About 228° C. . . . Crystallizing Point: About −12° to −14° C. . . . Refractive Index at 25° C.: 1.53 . . . Solubility: Miscible in most organic solvents, immiscible in water . . . Specific Gravity at 25°/25° C.: 1.1.

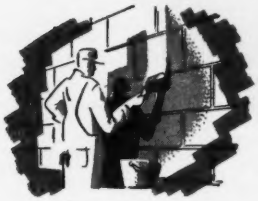


If you want to make wood last, read this book

A list of questions most often asked about Monsanto Penta (pentachlorophenol) has been compiled and the queries answered by Monsanto specialists.

If you are a user of wood in any type of construction, the booklet has a world of information that will be valuable to you. Mail the coupon for your free copy.

It costs no more to use AROCLORS



You can get the extra qualities that Monsanto AROCLORS* offer in high styrene-butadiene copolymer formulations, such as Pliolite S-5 and Marbon, without increasing your production costs. In addition, the AROCLORS increase stability and durability. They give formulations better resistance to actinic rays and heat. Coatings formulated with AROCLORS provide excellent protection against moisture, acids, alkali and other corrosive influence.

Ask for AROCLORS literature. Copies of the following bulletins are yours, without obligation: No. P-126, "AROCLORS as used in Pliolite S-5"... No. P-115, "THE AROCLORS"... No. P-124, "AROCLORS as used in chlorinated rubber"... No. P-131, "AROCLORS as co-plasticizers for polyvinylchloride." For your copies, contact the nearest Monsanto Sales Office or mail the coupon.

Proved product has new name

A new, high-molecular-weight alcohol ester, developed by Monsanto as an efficient defoaming agent, has been known as AE-1. The name now has been changed to *Sterox® 110.*

The numerous uses for Sterox 110 include: A defoamer in producing ethyl alcohol from molasses . . . defoamer in producing glycerol from fats . . . for foam control in the manufacture of yeast and other fermentations . . . control of foam in certain bottle-washing operations . . . solving foam problem in polystyrene latex water dispersions . . . lubricant for vinyls that are extruded or calendered . . . coplasticizer for rubber hydrochloride and chlorinated rubber.

Looking for sodium phosphates? Look to Monsanto!

Monsanto is one of the world's most important producers of phosphates, including the sodium phosphates. Quality in these products is controlled every step of the way from the phosphorus matrix to final shipment.

Monsanto mines phosphorus matrix from the hills of Idaho and Tennessee . . . converts to elemental phosphorus of better than 99% purity . . . makes phosphoric acid from which the phosphates are derived.

Monsanto Sodium Phosphates include:

Mono Sodium Phosphate
Uses:
Acid cleaners — Textiles
Water treatment

Di Sodium Phosphate
Uses:
Cheese — Water treatment
Leather — Dye
Textiles — Pigments
Detergents

Tri Sodium Phosphate
Uses:
Water softening — Water treatment
Detergent — Textiles
Metal cleaning

Tetra Sodium Pyrophosphate
Uses:
Soap — Pitch control
Textiles — Metal cleaning
Detergents — Oil well drilling
Clay dispersant — Water treatment
Dyeing — Water softening
Bleaching — Glass

Sodium Acid Pyrophosphate
Uses:
Baking Powder — Electroplating
Oil well drilling — Prepared flour

Sodium Tripoly Phosphate
Uses:
Detergents — Water treatment
Pitch control — Clay dispersant
Metal cleaners

For details on these products and their applications, contact the nearest Monsanto Sales Office or mail the coupon.

MORE PHOSPHORIC ACID

Monsanto has increased its capacity to produce phosphoric acid, ammonium phosphates and potassium phosphates for use in making liquid and water-soluble fertilizers. The advantages of liquid and soluble fertilizers are: High concentration of nutrients, quick availability to plant roots, ease of handling and application.

• • • • • • • •

MONSANTO CHEMICAL COMPANY, 1700 South Second Street, St. Louis 4, Missouri. District Sales Offices: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle, Twin Cities. In Canada, Monsanto Canada Limited, Montreal.

*Reg. U. S. Pat. Off.

MONSANTO
CHEMICALS – PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

SEND INFORMATION: ☐ Benzoic Acid. ☐ Benthal. ☐ ortho-ETHYLNITROBENZENE. ☐ Sodium Phosphates for use in.....

SEND LITERATURE: ☐ Bulletin O-78, "ortho-Nitrobiphenyl." ☐ Bulletin O-80, "Benzyl Chloride." ☐ Bulletin O-81, "Santicizer 3." ☐ Booklet, "Your Answer Book on PENTA Wood Preservation." ☐ Bulletin P-115. ☐ Bulletin P-124. ☐ Bulletin P-126. ☐ Bulletin P-131. ☐ Bulletin, ortho-Ethylnitrobenzene.

SEND SAMPLE: ☐ Sterox 110.

MONSANTO CHEMICAL COMPANY
1700 South Second Street, St. Louis 4, Missouri

Please send, without cost or obligation, information, literature or sample as indicated at left.

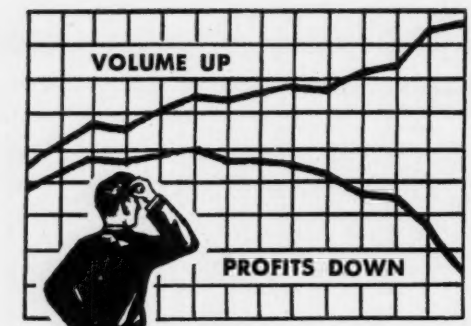
Name.....Title.....

Company.....

Street.....

City.....Zone.....State.....

AJAX Lo-Veyors



HERE IS ONE OF YOUR FEW REMAINING WAYS TO PARE DOWN RISING COSTS

● Materials handling by old-fashioned, man handling methods is an easily overlooked, but expensive item in your non-productive labor column. This is increasingly true under present day operating conditions. Manufacturers are taking advantage of Ajax Lo-Veyors as a source of important economies in handling bulk materials.

Ajax Lo-Veyors provide fast, automatic, trouble-free handling of bulk materials in and outdoors, under abrasive, corrosive, poisonous and explosive laden air.

Write for facts on the advantages of Ajax Vibrating Conveyors.

AJAX FLEXIBLE COUPLING CO. INC.
WESTFIELD, NEW YORK

Reports from Users

Showing Typical Results on Corrosion-Control Problems where *Carpenter* STAINLESS No. 20 is used

Corrodent PRIMARY CONSTITUENT	REMARKS	PROCESS	RATING
Aluminum sulfate plus alumina	245°F.	Mfg. of aluminum sulfate.	Excellent, no sign of pitting after 35 working days.
Concentrated chlorine solution	— —	— —	Type 304 pitted. No. 20 satisfactory.
Fluoborate Plating Solutions	— —	Electroplating copper, zinc, etc.	Recommended for use in any of the commercial fluoborate plating solutions.
Maleic acid	30% concentration	— —	Excellent (better than Type 316).
Phosphoric acid	70% phosphoric 5% sulfuric some hydrofluoric boiling acid at 135°C.	— —	Excellent. Corrosion rate obtained: .0180 IPY.
Sulfuric acid	15/50% H_2SO_4 at room temperature	Nozzle for filling storage batteries.	Excellent.
Sulfuric acid	2 to 3% H_2SO_4 room temperature to boiling	Pickling tank.	Under severe working conditions Carpenter Stainless No. 20 showed no appreciable loss of weight due to corrosion (.00012 IPY).
Sulfuric acid	93% H_2SO_4 saturated with sulfur dioxide	— —	Excellent. Negligible corrosion rate (.00006 IPY).
Sulfuric acid	1% to 105% H_2SO_4	Die manufacturing. Heat exchanger coils.	Approx. 8 times as resistant as lead. Expected equipment life 4 years with Stainless No. 20.
Sulfuric acid	10% solution 140/160°F.	Acid dip pickling process.	Excellent.
Wet Chlorine Gas	— —	— —	Not recommended.
Zinc Phosphate	Solution contained approx. 5% sodium chloride at 180°F.	— —	Estimated life 10 to 30 times that of Type 302 or 304. Total exposure during test: 460 hours.

NEW BOOK *describes Carpenter Stainless No. 20, its corrosion resistance and working characteristics. For your copy, just drop us a note on your company letterhead.*

THE CARPENTER STEEL COMPANY
127 West Bern Street, Reading, Pa.

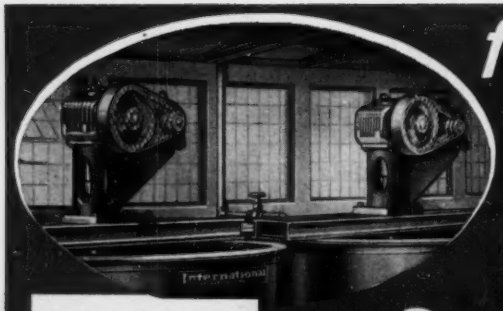
Export Dept: The Carpenter Steel Company, Port Washington, N. Y.—"CARSTEELCO".

Carpenter

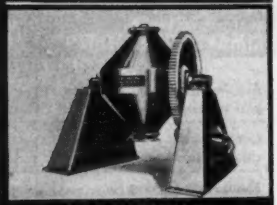
STAINLESS NO. 20

Licensed under patents of The Duriron Co., Inc.

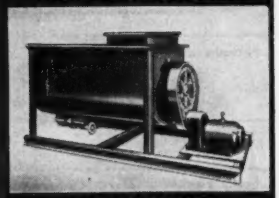
for Greater Savings in Production Costs



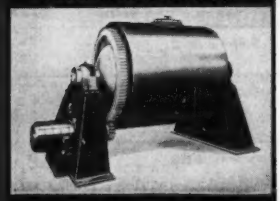
TYPE LRB—TURBINE AGITATORS with V-Belt Drive. Changeable Speed. Available for Open or Closed Pressure Tanks. Any Size.



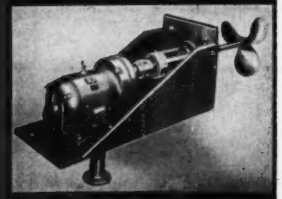
DRY BLENDERS
From 25 to 10,000 lbs.



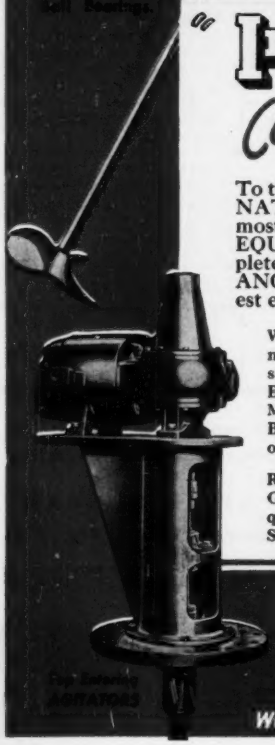
RIBBON MIXERS
From ¼ to 175 cu. ft.



BALL MILLS
Welded Steel Construction



SIDE ENTERING MIXERS
½ to 30 H.P.



"International" Complete Processing Systems

To the Chemical and allied Industries, INTERNATIONAL ENGINEERING offers the most complete line of Modern PROCESSING EQUIPMENT ever presented—with a completely INTEGRATED and perfectly BALANCED SYSTEM of operation, for the highest efficiency and lowest costs.

When you're making improvements, building a new plant, or expanding your present facilities, be sure to check with INTERNATIONAL for the latest Engineering Developments in improved EQUIPMENT for the correct and most economical BLENDING, TREATING, MIXING and GRINDING of Chemical components.

REMEMBER—INTERNATIONAL manufactures and Guarantees the Equipment you need, in any required sizes and capacities . . . Write today for Special Catalogs on any product. No obligation.

INTERNATIONAL ENGINEERING, INC.

DAYTON 1, OHIO

NEW YORK—15 Park Row CHICAGO—407 S. Dearborn

WOrth 2-2580 DISTRICT REPRESENTATIVES IN PRINCIPAL CITIES WAbash 2-0733

Memo from the Editor John R. Callaham

JULIAN SMITH: ". . . classify size reduction operations by the action of equipment."

GORDON KIDDOO: ". . . emphasize processes used to convert petroleum materials into chemicals."

Take a Fresh Look . . .

. . . at size reduction.
. . . at petrochemical processes.

Soon we'll be giving you a couple of feature reports you'll find especially interesting. Both take a fresh approach to their subjects.

▶ **Size Reduction**—Most engineers classify size reduction operations by the size of the product that's turned out: coarse, intermediate, fine; crushing, grinding, pulverizing and the like.

Now Julian Smith (who's working up our report) comes forth with a fresh approach. Why not, he asks, classify size reduction equipment by the four types of reducing action: squeezing, impact, cutting, attrition?

You can see, for example, that a jaw crusher reduces by squeezing, a hammermill by impact. This system, we believe, puts size reduction as a unit operation on a more sensible engineering basis.

Julian will discuss the major types of machines under each of these four "action" categories. And on each he will discuss: (1) principles, (2) sizes, capacities and power requirements; (3) applications and limitations; (4) special features.

Over 30 leading equipment firms are cooperating in supplying information for this report (which we have been planning and working toward for well over a year now).

Author Smith—who's now associate professor of chemical engineering at Cornell—has had years of experience with Du Pont in plant operations, engineering and design.

▶ **Petrochemical Processes**—Last year we happened to be talking to Gordon Kiddoo, who's now director of the development department up at National Research Corp. in Cambridge. We knew about Gordon's years of practical experience with Texas Co., Hydrocarbon Research and other firms.

Would he be willing to tackle a comprehensive report for us on petrochemical processes—halogenation, aromatization, hydration and all the rest? Processes, not products?

We took a quick look at what had already been done. Most of it was along the lines of reviewing the industry—its size, plants, products or raw materials. We didn't find any recent comprehensive job that stressed unit processes.

Upshot of it all is that Gordon is now putting the finishing touches to his report on petrochemical process technology.

This approach, as we see it, organizes the vast petrochemical industry around the logical framework of unit processes. The more recent processes, naturally will be stressed most; emphasis will be given to those that are unique or characteristic of petrochemical operations.

I believe you'll like the job Gordon Kiddoo is now doing for us on petrochemical processes. You'll see it soon.

NOTE: Our stocks also include nickel-bearing stainless in a wide range of types for quick shipment subject to NPA controls.

Life-saver for Users of Nickel-Bearing Steels

Straight Chrome Stainless for Quick Shipment from Ryerson

If you are among those handicapped by government restrictions on nickel-bearing 18-8 stainless, large Ryerson stocks of straight chrome stainless may prove to be a life-saver. For example, many who formerly used type 302 sheets to meet mild corrosive action are finding a practical alternate in type 430. And this 17% chrome stainless is on hand now —ready for immediate delivery from your nearby Ryerson plant.

You can order type 430 sheets from Ryerson in all gauges from 10 to 26, in No. 2B or No. 4 finish—and in almost any quantity. You can also get quick shipment of these additional straight-chrome products: type 405 sheets—types 410 and 430 plates—and type 416 bars. It all adds up to the nation's largest stock of straight-chrome stainless. All with no restrictions on end use, but all time-tested Allegheny stainless of uniform high quality and definitely established characteristics.

In this stock, you may well find a steel that will enable you to maintain satisfactory quality in your product until nickel-bearing steels are again available. So now for stainless, we urge you to consider the versatile chromium stainless steels in Ryerson stock.

RYERSON CERTIFIED STEELS

WRITE FOR HELPFUL DATA—*On Type 430 and Other Chrome Stainless*

To help you convert to chrome stainless, we shall be glad to send an authoritative bulletin on the mechanical properties, corrosion resistance, weldability, etc., of these steels as compared with 18-8 stainless. Write for your copy. And remember that the advice of Ryerson stainless specialists is always yours for the asking. We suggest you discuss your chrome stainless problems with us.

National Warehouse Distributor of Allegheny Stainless in All Types, Shapes and Sizes

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI • CLEVELAND • DETROIT
PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SEATTLE • SPOKANE

SIDNEY D. KIRKPATRICK, Editorial Director
JOHN R. CALLAHAM, Editor

Chemical Engineering

JULY 1952

BUILDERS OF THE CHEMICAL CENTURY

Engineering is primarily a profession of planners and builders. It is the engineer's task to translate his dreams and those of his fellow men into enduring realities. He links science with industry, discovery with achievement, progress with profits. The profession prospers only as it serves the needs of society.

Chemical engineering, born in an era of challenge and change during the early years of this century, has met the challenges of a changing world. In the past fifty years our profession has grown in stature and influence. It had its baptism of fire in World War I. Twenty years later the nation turned to its chemical engineers for the essential munitions of war, for life-saving drugs, for synthetic rubber and other strategic raw materials—even for the atomic bomb.

Now, once again, we are in the battle of production. America's fate as a free people, and perhaps that of the world, may well depend on how efficiently the engineers can plan, design and build for the future.

The Twentieth Century has been aptly called This Chemical Century. No other sector of our industrial economy seems to hold the same potentials for dynamic growth. Linked inseparably to creative research, the chemical process industries are certain to continue opening new frontiers in science and technology. Progress can and will be more rapid because of the pioneering achievements of those who have gone before us. To them we owe a great debt which we can best repay by passing on to our successors some of the knowledge and experience we have gained in the half a century that has been ours.

Because this magazine has played a modest part in the development of the chemical engineering profession, because its pages have recorded, interpreted and often guided the progress of the process industries, because its editors are proud to have been associated with the men who have built and are continuing to build for the future, this Fiftieth Anniversary Issue of *Chemical Engineering* is respectfully dedicated to the "Builders of the Chemical Century."

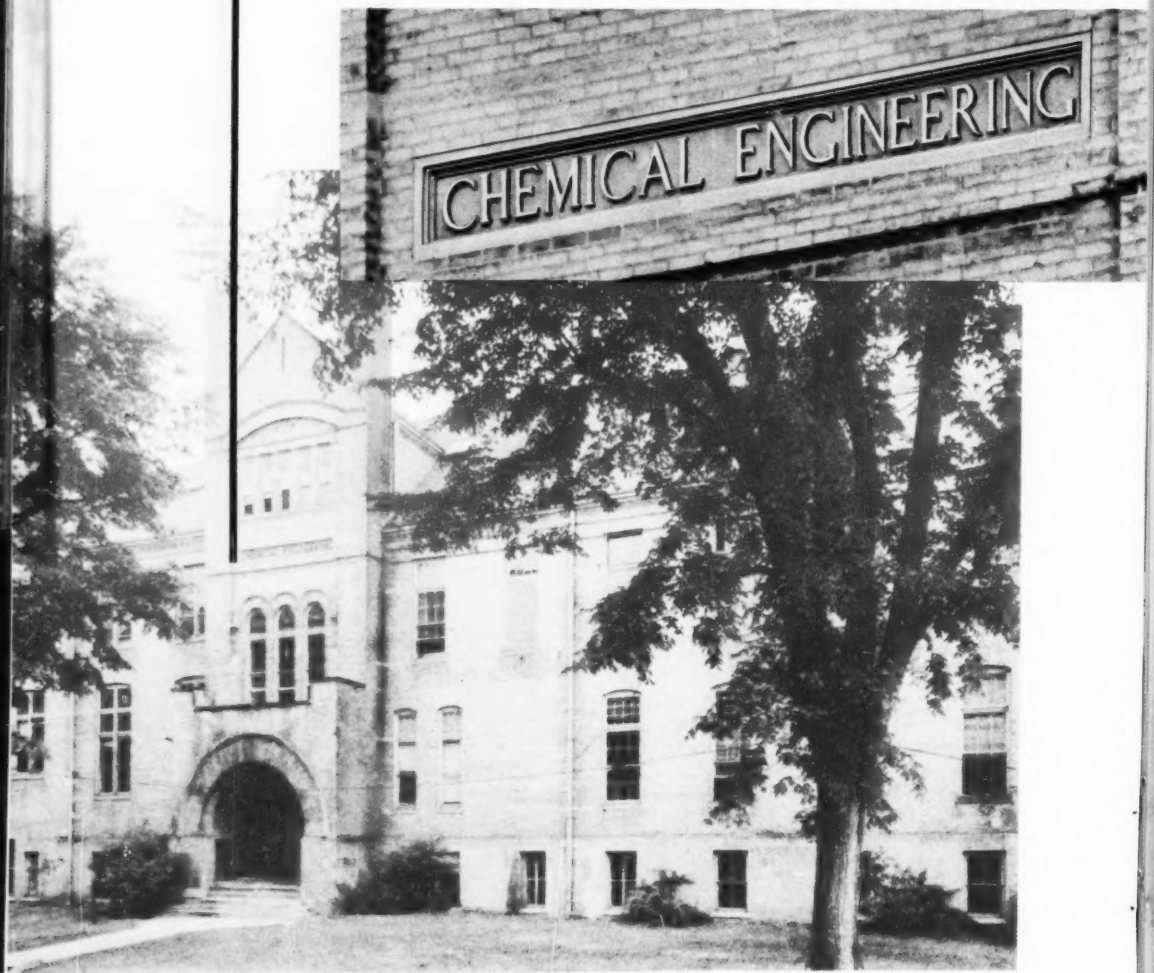
W. D. Parmelee
EDITOR 1917-1928

Sidney D. Kirkpatrick
EDITOR 1928-1950

John R. Callaham
EDITOR 1950-

ON THESE FOUNDATIONS....

How we got started as a profession and where we're going are revealed in this intimate, personalized history of the advances and achievements of chemical engineering's first fifty years by Sidney D. Kirkpatrick



Chemical Engineers Build for the Future

ONE DAY in the early 1900's the foundry at the University of Wisconsin received a rush order for nineteen large bronze letters. Here was the assortment: Four E's, three each of I's and N's, two each of C and G, and one each of A, H, L, M and R.

Then, one dark night a few weeks later, a scaffolding went up over the main entrance of one of the university buildings. Mysterious sounds were heard – heaving and hammering and equally mysterious lights were seen. Came the dawn. And there, high above the portals of what had previously been the old Chemistry Building was a new name cast in letters of imperishable bronze. The nineteen letters now rearranged spelled out the words–CHEMICAL ENGINEERING.

Thus Prof. Charles F. Burgess, who with his little band of chemical engineering students at Wisconsin had been pushed from pillar to post, finally staked a lasting claim to a pioneering development in engineering education.

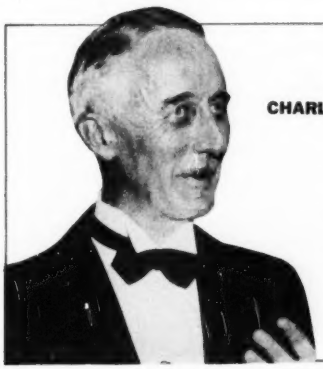
Burgess was primarily an electrical engineer who recognized the importance of chemistry. In a brief note in Vol. I, No. 1 of *Chemical Engineering's* predecessor, *Electrochemical Industry*, he explained that the four-year course at Wisconsin had been designed with the idea that the electrochemical engineer should be primarily an engineer with, however, considerable knowledge of chemistry and chemical engineering subjects. There was a very practical reason for this. In the early days of this century, the great electrochemical industries were getting underway at Niagara Falls. There was pressing need for engineers with better grounding in the sciences of chemistry, physics and mathematics.

But chemical engineering as we know it today, is not of such simple antecedents. What was probably the first course in chemical engineering in this country, or any other for that matter, was established at the Massachusetts Institute of Technology in 1888. Its emphasis was primarily on mechanical engineering – "to meet the needs of students who desire a general training in mechanical engineering and at the same time wish to devote a portion of their time to the application of chemistry to the arts." But this experiment in "educating engineers with an acquaintance with chemistry" did not succeed immediately. Too often it proved that only a "bowing acquaintance" was quite inadequate. Real progress did not come until 1903 when the M. I. T. courses were recognized and reoriented by William H. Walker, who was then a partner of Arthur D. Little, consultant in Cambridge, Mass.

The second program in chemical engineering was established by Alfred H. White at Michigan in 1898. He had previously taught industrial chemistry at Illinois under Samuel W. Parr, but on returning to Ann Arbor, after a year of graduate study in Zurich, had insisted that his course should be a part of the engineering college. This proved a very fortunate circumstance and again set an early pattern for closer affiliation with the engineering profession.

At Armour Institute of Technology, Harry McCormack organized a chemical engineering course in 1900. Columbia University launched its program first under Charles F. Chandler in 1905 – later to be carried to new heights by Milton C. Whitaker. Edward Hart at Lafayette in Easton, Pa., Samuel P. Sadtler (the first president of the American Institute of Chemical Engineers) in Philadelphia, William Albert Noyes at Rose Polytechnic Institute and later at Illinois – these were other able teachers who had attracted students interested primarily in "applying chemistry to the arts."

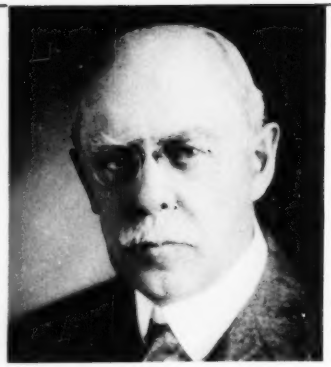
But the really lasting foundation for our profession



I remember . . .

CHARLES F. BURGESS, 1873-1945

He was so mildly mannered and extremely modest that few of our generation realize how much Charlie Burgess contributed to the basic engineering foundations of our profession. Of all his many inventions and industrial achievements, he was most proud of his successful fight to establish the department of chemical engineering at Wisconsin. Ten years ago I was privileged to present him with the Acheson medal of his beloved Electrochemical Society. Three years later we were together on one of its programs in Chicago when the great man was seriously stricken. Putting his arm across my shoulder, he whispered, "Sid, I am very tired." Two weeks later he was dead. Our profession is greatly in his debt. S.D.K.



I remember . . .

ARTHUR D. LITTLE, 1863-1935

A New England gentleman of distinguished appearance and attractive personality, Arthur Little was a credit to chemical engineering. He graced the profession with charm and culture. He lent dignity and authority to a young and aspiring branch of engineering. His writings gave new and well-defined purpose to the American Institute of Chemical Engineers. His courageous pioneering in establishing the School of Chemical Engineering Practice at M.I.T. marked a milestone in chemical engineering education. Indeed, Arthur Little did much to promote the welfare of the Institute and the profession at a time when they were not flourishing as they are today. H.C.P.

was laid in 1903 when William H. Walker was asked to return to M. I. T. and develop its course in chemical engineering. In the face of considerable opposition, he cut the ties to mechanical and civil engineering and launched a plan to develop chemical engineering as "itself a branch of engineering, the basis of which is those unit operations which in their proper sequence and coordination constitute a chemical process as conducted on the industrial scale."

The unit-operation concept, most often credited to Walker and Little, may well have had its origin a number of years before in the lectures and early writings of an Englishman—George E. Davis of Manchester. His two-volume "Handbook of Chemical Engineering," first published in 1901, was based on a series of lectures delivered at the Manchester Technical Institute in 1887. Here was a crude attempt to resolve chemical engineering into its unit operations, even though the term itself had not yet been coined. It is also of interest to note that Davis as long ago as 1880 had proposed the formation of a "Society of Chemical Engineers." Sir William Crookes, then editor of the *Chemical News*, strongly opposed the suggestion and argued in favor of a "Society of Technical Chemists." Sir William was afraid that the term "chemical engineer" might possibly admit men "who are not chemists at all!"

From out of this controversy was born the Society of Chemical Industry in June 1881. But it was not until October 1918 that the society belatedly established its Chemical Engineering Group within S. C. I. In December 1922 the famous British Institution of Chemical Engineers was incorporated in Britain as a qualified professional organization.

It Began With An Editorial

Here in the United States there were similar controversies—yet we made considerably more rapid progress. And it is interesting to note that it was another editor who started the argument that was to lead to the formation in 1908 of the American Institute of Chemical Engineers.

That editor was Richard K. Meade, a chemical graduate of the University of Virginia who had made a name for himself in the lime and cement industry. In November 1904 he had the courage to start a new monthly magazine called *The Chemical Engineer*. That brave little journal was just a year old when its editorial page propounded the question: "Why not an American Society of Chemical Engineers?" The mining, civil, electrical and mechanical engineers already had strong professional organizations. So Editor Meade saw no reason why chemical engineers should not profit from a similar organization.

"The profession is now a recognized one," he said, "and there are probably at least five hundred chemical engineers in this country." He went on to point out that too many firms were inclined to employ mechanical engineers to build plants to carry out chemical processes. "The reason is that they probably do not under-

I remember . . .

JOHN C. OLSEN, 1869-1948

In my cub days I often climbed the stairs to the good doctor's office on the top floor at Brooklyn Poly. His two desks were piled high with unfinished work, but he always had time to talk about chemical engineers and the profession. Many's the time we dug into the pile for unpublished manuscripts to round out an Institute program—and incidentally to help fill the editorial pages of *Chem. & Met.*! Since then life has become more complicated for editors and Institute secretaries. J. C. Olsen lived simply and honestly. His long life was full of unselfish service to the people and institutions he loved. The lives of thousands of us are richer because of his great devotion to our profession. S.D.K.

stand the significance of the profession of chemical engineering. They regard the chemist as a man of test-tubes and beakers and the term 'chemical engineer' as just a high sounding title some chemists have adopted. A national society of chemical engineers can do much to correct this impression and to properly advertise and advance the profession."

Not much happened, immediately at least, but Editor Meade was not easily discouraged. In March 1907 he reprinted his editorial and sent out copies for comment and criticism to fifty or more of the leading chemists and chemical engineers. Encouraging responses from such men as William H. Walker, W. M. Booth, Samuel P. Sadtler, Arthur D. Little, John C. Olsen, H. P. Talbot, H. E. Diller and E. C. Holton led to a brief meeting of these gentlemen at Atlantic City during the 1907 convention of ASTM. They debated long and seriously, finally deciding to ask a committee of six to find out how many American chemical engineers might be willing to join and support a new organization.

Charles F. McKenna, Sr., of New York, headed the new committee which immediately sent out a questionnaire to more than five hundred members of the chemical profession in the United States and Canada. About two hundred replies were received and three-quarters of these favored forming the new society. Nevertheless there were strong and influential opponents – men like the good Charles F. Chandler and his younger colleague, Marston T. Bogert, whose first loyalties were to the American Chemical Society.

Carefully considering all the replies, the McKenna Committee with Meade, Olsen and Walker present, decided to form still another committee. Fifty men prominent in the chemical profession were selected with care being taken to include those who opposed as well as those who favored the new society. Invitations went out for a meeting at the Hotel Belmont on January 18, 1908. Twenty-one of the fifty were present and fourteen others expressed their views in writing.

It was a cold day in New York, but judging from the stenographic report of the meeting the discussion waxed warm and vigorous. Under less expert hands than those of Dr. McKenna, the Belmont gathering might well have broken up in disorder. Instead, it produced a helpful, stimulating debate, even though it failed to reach a definite conclusion on the problem before it.

Later, after a complete transcript of the proceedings had been prepared, the committee decided to circulate this report and some related material for mail vote to the entire committee of fifty. There was included a memorandum of the rather stringent membership requirements that had been developed by the McKenna committee and which, with minor changes, were subsequently to be incorporated into the first constitution of the society. And, finally, the committee presented for ballot the following propositions:

(1) The proposed organization shall be called the American Institute of Chemical Engineers.
(2) The Institute should not attempt the publication of a journal, but should confine its publication to a volume or volumes of Transactions.
(3) None of the existing journals should be designated as the official organ, but members should be free to publish articles wherever they chose.

Thirty-six replies were received from the committee of fifty. Twenty-two of these were in the affirmative, six were negative, and eight were neutral, although three of these men stated that they would join if the new organization were formed. With sentiment so overwhelmingly in favor of the project, the committee decided to proceed with the formation of the new society. An organization meeting was called for June 22, 1908, in Philadelphia, and invitations were sent to a selected list of a hundred chemical engineers who by training and experience appeared to be qualified for membership.

The Forty Founders of A.I.Ch.E.

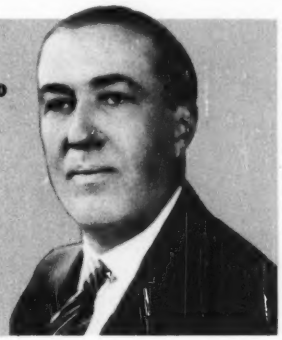
Enthusiasm ran high among the 40 men who met in the Engineers Club in Philadelphia on that hot June day in 1908. Dr. Samuel P. Sadtler welcomed the society on behalf of Philadelphia's chemical industries. Dr. McKenna responded with his stirring address, "The Justification of the American Institute of Chemical Engineers." This is one of the great contributions to the literature of our profession and as such holds a prominent place in Volume I of the Transactions of AIChE.

Following Dr. McKenna's address a committee consisting of Richard K. Meade, Walter Renton Ingalls and Jerome Alexander duly examined the credentials of the forty men in attendance and subsequently recommended their election as charter members of the

I remember . . .

RICHARD K. MEADE, 1874-1930

Thirty years ago we met on a bus during an A.I.Ch.E. convention in Baltimore. We talked shop, for Dick Meade was inordinately proud of the little publication called *The Chemical Engineer* which he had founded in 1904 and supported during the six years of its struggling existence. But I had to learn from others that its crusading editorials were most responsible for the formation in 1908 of the American Institute of Chemical Engineers. This was characteristic of the man, for he was modest and unassuming. As a consultant in the lime and cement industry his work exemplified the highest ethical standards of the profession. His premature death was a serious loss to chemical engineering. S.D.K.



I remember . . .

THOMAS MIDGLEY, JR., 1889-1944

Up hill and down dale we rolled in an old cumbersome coupe. Yet there was nary a knock no matter how tough the going or how fast our pick-up. In the tank was some of the world's first Ethyl gasoline and at the wheel was its inventor, bubbling over with boyish pride. That was my first meeting in 1923 with the greatest showman of the chemical profession. I marvelled at his great energy, his wit and wisdom. I came to admire and love him as a brother. When fatally stricken with polio, he calculated the odds against him. He had drawn the one black card from a deck as tall as the Empire State building! When I last visited "Midge" in his great home in Worthington, Ohio, we joked about antiques (including that 1917 Buick). We played some recordings of parties in which we had both participated. Our parting was pleasant yet I had the feeling it would be our last. S.D.K.

Institute. The list follows:

American Institute of Chemical Engineers
Charter Members

Acheson, Edward G.	Hunicke, Henry August
Adamson, George P.	Ingalls, Walter Renton
Alexander, Jerome	Kaufmann, H. M.
Allen, Lucius E.	Langmuir, Arthur C.
Barton, G. E.	Mason, Wm. P.
Bassett, William H.	McKenna, Charles F.
Bement, A.	Meade, Richard K.
Booth, William M.	Miller, A. L.
Brown, H. F.	Olney, Louis A.
Camp, J. M.	Olsen, John C.
Catlin, Charles A.	Reese, Charles Lee
Dannerth, Frederick	Renaud, Henry Stanley
Dow, Allen W.	Reuter, Ludwig
Frerichs, F. W.	Robertson, Andrew
Grosvenor, Wm. M.	Sadtler, Samuel P.
Gudeman, Edward	Smith, Thorn
Haanel, Eugene	Trautwein, A. P.
Heath, George M.	Wesson, David
Hollick, Herbert	Whitfield, J. Edward
Horn, David Wilbur	Wiechmann, Ferdinand G.

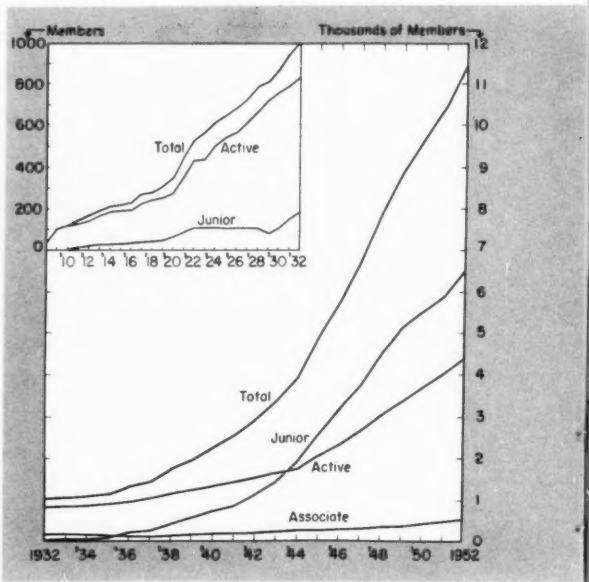
From this nucleus of forty in 1908, membership in the American Institute of Chemical Engineers has grown to 11,428 at the end of 1951. Of these 4,350 meet the professional qualifications of active members, 567 are associates and 6,511 are junior members. The early fears of those who felt that the new organization would weaken the work of the older American Chemical Society have proved unfounded. From about 3,500 members in 1908, its roll has now reached almost 70,000—an increase of 2,000 percent. Meanwhile the Electrochemical Society founded in 1902 and the American Institute of Chemists founded in 1923 have also grown in numbers and influence as they have served the chemical profession.

Chemical Engineering in Industry

The most enduring records of the advances and achievements of chemical engineering are to be found in the great growth of the chemical process industries. In 50 years manufacturing operations based on chemical engineering processes and equipment have become a substantial part of the national economy. And because many of these industries are largely the results of creative and expanding research, they will continue to set new records of growth and development (see article by Dr. R. H. Ewell elsewhere in this issue).

But progress in the process industries has not always been as sure or as rapid as in recent years. Production of "Chemical and Allied Products" as reported in the famous 1900 census, compiled under the direction of Dr. Charles E. Munroe, was small and unimpressive.

Membership in the American Institute of Chemical Engineers has climbed from 40 in 1908 to almost 12,000. Indicative of a young profession, more than half are juniors.



Sulphuric acid and a few other heavy chemicals were made with fair efficiency and in adequate volume to supply our needs. Most organic chemicals, however, were imported or made from intermediates of foreign origin. Yet in the early 1900's a considerable surge of industrial activity was getting under way in this country, particularly in connection with the electrochemical and electrometallurgical developments along the Niagara frontier. Discoveries of men like Charles M. Hall and Edward G. Acheson, Frederick M. Becket, Castner, Townsend and Hooker became the bases of thriving industries. Charles S. Bradley was trying desperately to establish an atmospheric nitrogen industry. Herbert H. Dow, after many difficulties, had successfully launched the great electrochemical industry that centers at Midland, Mich.*

Here are some notable dates as this chemical century got under way: The first American contact sulphuric acid plant was built in 1901 at Mineral Point, Wis. In 1902, Willis H. Carrier – recognized as the father of air conditioning – designed his first system for scientifically controlling humidity and temperature. Birkeland and Eyde started their nitrogen fixation plants in 1903. Two years later Frank and Caro developed their cyanamide process in Germany. Cottrell in 1904 had invented the electrostatic precipitator. Becket first produced pure ferro alloys in 1905. Baekeland's great discovery of the thermosetting phenolic resin came in 1908. Dreyfus made his first cellulose acetate silk in England in 1911. Brearly developed stainless steels in 1912 – the same year that William M. Burton put into operation at Whiting, Ind., the first process for thermo cracking of petroleum.

*For a most interesting, highly controversial report of the status of American electrochemical and electrometallurgical industries see two articles by Dr. Fritz Haber in *Electrochemical Industry*, Vol. I, Nos. 10 and 11, pp. 349-51 and 379-85 (1903). See also "critical notes" (pp. 385-7) from Herbert H. Dow and others who disagreed with the German gentleman's conclusions.

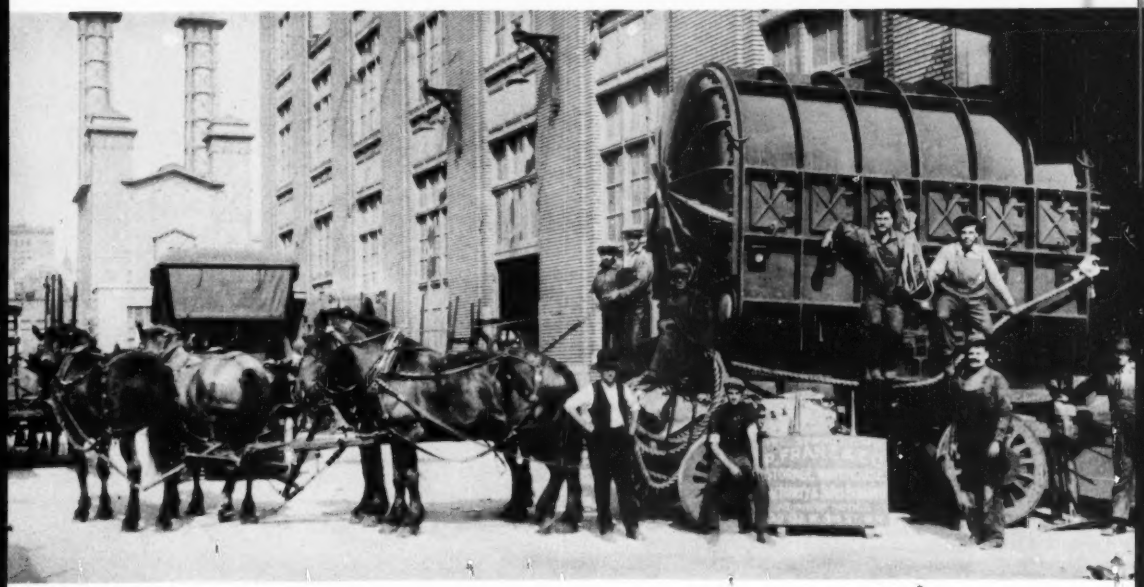
Chemical Engineering Gets Its Baptism of Fire

In the next decade we have the beginning of World War I – in which the chemical engineer first demonstrated his strategic role in the national defense. By 1913 Haber, with the help of Karl Bosch, had perfected a synthetic ammonia process in Germany. Chaim Weizmann had developed the fermentation process for producing acetone and butanol. Ion exchange for water treatment was established by Permutit. Pyrex had been introduced by E. C. Sullivan and his co-workers at Corning Glass in 1914. Sodium cyanide was first made by the Castner-Roessler process in Niagara Falls.

The following year found potassium permanganate first being made in the United States by Carus. A. M. McAfee of Gulf had patented his process for aluminum chloride refining of petroleum. A notable event was the first national Exposition of the Chemical Industries, held in New York in September 1915. The small group of patriotic chemists and engineers headed by Charles F. Roth thus signalized America's chemical independence.

By 1916 new capital investments in chemical industries were at the rate of $100 million per year. A domestic dyestuff industry struggled for its existence be-

Back in 1915 it took four horses and nine strong men to put this huge vacuum drier into place in Grand Central Palace in New York for the first Exposition of the Chemical Industries. This "Chem. Show" proved that America's budding chemical industry need not depend any longer on foreign sources for essential raw materials and equipment.



hind an emergency tariff wall. Dow produced magnesium by electrolysis of the fused chloride. W. S. Landis oxidized ammonia commercially to make "Ammo-Phos" as the first production of cyanamide got under way in this country.

A year later new chemical investments had reached $145 million as the organic chemistry industries began their phenomenal growth. The Gibbs-Conover process for phthalic acid by direct oxidation of naphthalene became the basis for an important development. Dow first produced synthetic indigo by the bromine process. Currie introduced citric acid fermentation at Pfizer. The government signed contracts for nitrogen fixation plants at Muscle Shoals as munition needs rose to new peaks.

Price controls tightened in 1918. New investment fell to $73 million, but technical developments continued to mount. Du Pont celebrated its 116th birhday with the completion of the Deepwater dyeworks. The War Industries Board under Baruch, Summers, MacDowell, commandeered basic chemical supplies and allocated their distribution. Synthetic acetic acid was made in the United States by Canadian Electro-Products Co. The Chemical Warfare Service completed the largest electrolytic alkali plant at Edgewood Arsenal (100 tons per day). Came the Armistice, Nov. 11, 1918, and with it a great uncertainty about the future of the American chemical industry.

Chemical Industry Bounces Back

Peversely contrary to expectations, 1919 proved an excellent year for the chemical industry. There were pent-up needs for so many peacetime products that most industries prospered. But trouble was in the offing. Chemical prices fell precipitously. Dealers, brokers and jobbers closed shop. Prohibition under the Volstead Act went into effect with serious restrictions placed on many legitimate chemical industries.

Yet, 1920 was to be a year of important business developments. Allied Chemical and Dye Corp. was formed by a merger of such important units as General Chemical, Barrett, Solvay and National Aniline. Pittsburgh Plate took over Columbia Chemical. Eastman Kodak moved into Tennessee. Standard Oil (N. J.) became the first petrochemical producer of isopropyl alcohol via the Ellis process. Hercules bought the Yaryan Naval Stores Co. Carbide and Carbon Chemicals Corp. was incorporated.

The business depression continued into 1921, although the general decline of chemical prices had ended and new industries were gradually getting under way. Demand for tariff protection against imports from Europe resulted in emergency legislation, followed a year later by the Fordney McCumber Tariff Act of 1922.

Here are some other significant dates as recorded by chemical industries' thoughtful historians Williams Haynes and Lawrence W. Bass (See Chemical Chronology in Volumes II, III and IV of "American Chemical Industry – A History," published by D. Van Nostrand Co. [1945-9]).

Harry L. Fisher developed the Vulcalok process to bond hard rubber to metals for B. F. Goodrich. Thomas Midgley, Jr., and T. A. Boyd discovered the anti-knock properties of tetraethyl lead. Furfural from farm wastes, was made commercially by Quaker Oats, with the cooperation of Miner Laboratories. Durite patents were granted for furfural resins. Carbide first made ethylene glycol commercially. Mathieson began to ship chlorine in multi-unit tank cars in 1922.

Herbert A. Winklemann and Harold Gray introduced aldol and naphthylamine as the first rubber antioxidants. Patrick discovered thiokol. The synthetic ammonia industry got under way about 1924 in small plants operated by Mathieson, Niagara Ammonia, Du Pont and Hooker. The giant works of Allied's Atmospheric Nitrogen Corp. at Hopewell, Virginia and the Claude process of DuPont's "Lazote" at Belle, West Virginia, were to come into operation a year or two later.

William J. Hale and E. C. Britton of Dow helped perfect phenol production from monochlorobenzene in 1925. First successful process for the recovery of bromine from sea water was another Dow development. U. S. production of synthetic methanol by Commercial Solvents at Peoria, Ill. Standard Oil (N. J.) acquired rights for the Bergius coal hydrogenation process and in 1927, initiated research at Baton Rouge, La., to apply the technique to petroleum. Dow became the sole American producer of metallic magnesium. Penn Salt

I remember

WALLACE H. CAROTHERS, 1896-1937

We first met back in the 20's in Dr. Roger Adams' office at the University of Illinois. Carothers was one of his most brilliant students, and the professor felt none too good about losing him for a two-year stint as a teacher at Harvard. Then he went to Wilmington and got lost, as far as I was concerned, in the intricacies of Du Pont research. But it wasn't long before we began to hear rumors of great achievements in high polymers. First came neoprene with its remarkable properties. Then came nylon, the first truly synthetic fiber. But only a few years later we were to meet for the last time at that fateful Electrochemical Society meeting in Philadelphia. His premature death robbed the chemical world of one of its greatest geniuses. S.D.K.

and Hooker built their alkali plants on the West Coast in 1928.

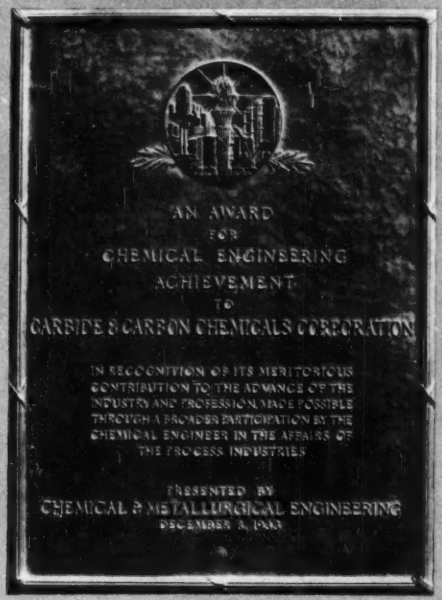
By 1929, the census reported that the Chemicals and Allied Products had reached an output of $3,759,404,640 as compared with $2¼ billion in 1921. For the first time, the big three among the heavy chemicals – sulphuric acid, soda ash and caustic soda – far exceeded World War I peaks. U. S. Potash began drilling its deposits at Carlsbad, N. M.

And then something happened in Wall Street. To some it seemed the end of the world. The stock losses of 25 million people totaled $50 billion between 1929 and 1931. Yet again we find many chemical industries moving ahead in spite of the depression. New products and new processes helped to cushion the shock. Hydrogenation of petroleum to give the first high-octane gasolines opened up a new era of high pressure and catalytic synthesis. New solvent refining processes upset established methods in the oil industry. Synthetic ethyl alcohol became the first tonnage product of the new petrochemical industry. New vinyl and acrylic plastics were soon bidding for the markets of older materials. Synthetic fibers made in the United States accounted for a third of the world's output and were still growing. Nylon, the world's first truly synthetic fiber, did not make its appearance until 1938.

In 1933, the first Award for Chemical Engineering Achievement was presented to the Carbide and Carbon Chemicals Corp. for its pioneering work in the development of a great synthetic organic chemical industry, based on the hydrocarbons of petroleum and natural gas. This recognition was sponsored by the editors and publishers of this magazine on behalf of the chemical engineering profession primarily to promote group effort and teamwork on the part of chemical engineers and management.

Subsequent awards in this series marked many of the important advancements and achievements of our profession. In 1935 the second award was presented to the Organic Chemicals Department of E. I. du Pont de Nemours & Co. for the successful development of the synthetic rubber now known as neoprene and the production of synthetic camphor from American turpentine. Two years later, Monsanto Chemical Co. was recognized for the electric furnace production and utilization of elemental phosphorus in tank-car quantities, soon to become the basis of a new chemical industry.

In 1939, the award for Chemical Engineering Achievement was presented by *Chem. & Met.* to the Standard Oil Development Co. for distinguished work in developing new aviation fuels and synthetic products from petroleum. On Dec. 5, 1941, two days before Pearl Harbor, the Dow Chemical Co. was honored for the large-scale production of magnesium from sea water, sorely needed for aircraft and munitions.



First of ten bronze plaques to honor outstanding achievements by group effort of chemical engineers in industry.

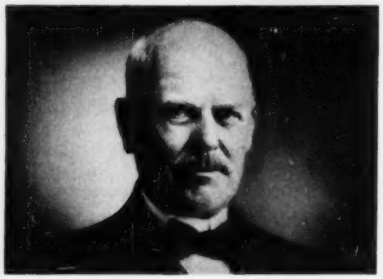
Two Great Wartime Achievements

During the next four years, all of our resources were pooled in a great group effort to win World War II. It is significant that two of the greatest industrial achievements of the war were recognized by the *Chemical Engineering* awards of 1943 and 1945. First was for the building in less than two years of a great billion dollar synthetic rubber industry. Eighty chemical, rubber and petroleum companies shared the award. The second was the role played by chemical engineers in the successful development of the atomic bomb. Here there were recognized more than a hundred companies, universities and research organizations most responsible for the achievement.

The first postwar award was made in 1947 to Merck & Co. for "distinguished service to humanity," in the commercial development of the wonder drug, streptomycin. In 1948, the honor went to Shell Chemical Co. for the successful synthesis of glycerine from petroleum sources. The following year Celanese was recognized by the chemical engineering profession for the way in which it had integrated its petrochemical, plastics and textile operations.

Most recently, in November 1951, the eleventh Award for Chemical Engineering Achievement was presented to the Phillips Petroleum Co. for its pioneering work in the development of high-abrasion carbon blacks and its major contributions to the success of the cold rubber program.

All such advances and achievements of our profession are but the foundation on which we are to build for the future of this chemical century. It is evident that those who have gone ahead have made many important and lasting contributions to our basic technology and its ever widening application to the process industries. Their record is a challenge to us all.



EDWARD G. ACHESON, 1856-1936

Like J.V.N. Dorr and Paul J. Kruesi, Dr. Acheson was always inordinately proud of having served his apprenticeship with Thomas A. Edison. Starting as a draftsman at Menlo Park, young Acheson soon won the old man's confidence and was permitted to experiment "on his own." Out of that came his electric-furnace process for producing silicon carbide and, as a sequel, the production of artificial graphite. Both became the bases of great industries. Mr. McGraw often said that without Acheson's support he would not have had the courage to launch this magazine. His great loyalty to the American Elecrochemical Society still finds tangible expression in the Acheson medal and award. SDK

LEO HENDRIK BAEKELAND, 1863-1944

Two amusing side-lights in the colorful career of the "father of plastics": Once some neighbors in Yonkers called on me for professional advice. Silver and platinum had been discovered in the sands of Saw Mill River not far from the abandoned laboratory where the good doctor had invented Velox photographic paper. Needless to say, the "gold rush" quickly subsided. Several years later Baekeland called me to his office to discuss A.I.Ch.E. affairs. As I was about to leave, he said, "Here, Friend Parmelee, are the results of some experiments I'm making in biological chemistry. Please take home a couple of samples." They were wine from his own winery at Coconut Grove, Fla. Despite his wealth and achievements, Baekeland remained unspoiled—a good friend and gracious host. HCP

FREDERICK G. COTTRELL, 1877-1948

When we met in Paris at the end of World War I, his name was already synonymous with electrostatic precipitation. But I soon discovered that this tall, strangely handsome, exceedingly polite scientist was one of the most humanly interesting characters I've ever known. Our talks ranged from student journalism to Esperanto, to gold from sea water, to homing pigeons. Only later was I to learn of his great zeal for the encouragement of research, especially by the youngsters of our profession. It was this combination of energy, enthusiasm and vision that led to his unselfish launching of the Research Corporation in 1912. As a man of great good will, he has been aptly called the Good Samaritan of Science. SDK

HERBERT H. DOW, 1866-1930

He became a chemical engineer the hard way. He spent his life translating laboratory possibilities (and some that seemed impossibilities) into profitable actualities. In so doing he set the pattern for the ever-expanding operations of his own company and of the American chemical industry. To visit in his home, to walk and talk in his gardens, to share intimately some of his reminiscences of the early days when he was a frequent contributor to the pages of the *Electrochemical Industry* – these are proud memories I shall always cherish. His life set a high standard for on-coming generations of chemical engineers in the management of great industries. SDK

FREDERICK M. BECKET, 1875-1942

I remember him as a quiet, soft-spoken gentleman of dignity and personal charm, friendly and cordial in his human relations. He was a good conversationalist in any group, and I early noted his skill in the use of English. Later I found this exemplified in the meticulous composition of his articles and patent specifications. His chief claim to fame was in the production of carbon-free chromium, tungsten, molybdenum and vanadium by direct reduction of their oxides with silicon. But his mind ranged over a wide variety of technical problems and for all his devotion to technology, he was no stranger to music, art and the humanities. HCP

WILLIS H. CARRIER, 1876-1950

When we were New Jersey neighbors in the 20's, Mr. Carrier was my chief source of chemical history. He had lived and worked with Edison, Weston and Hyatt. His first crude air-conditioning equipment in chemical industry went into the old Celluloid plant, back in rubber-collar days. I remember the show at the Carrier plant when he demonstrated his first centrifugal refrigeration machine with its challenging design. Today it's standard equipment throughout the world. Unfortunately Willis Carrier died two years before the air conditioning industry he founded will celebrate its 50th birthday, July 17, 1952. But he lived to see his work contribute greatly to man's health and progress. SDK

WILLARD H. DOW, 1897-1949

Whenever I think of the most famous family of Midland, Mich. I am reminded of the ringing words of Dr. McKenna as he helped found the AIChE—"We begin as brothers. We inevitably will close our careers as fathers, passing on to our sons in the profession a heritage of knowledge and light that shall increase as the flame increases with the fuel." No one I know had a greater heritage nor held it more seriously than Willard Dow. On the foundations laid by the father, the son built a vast chemical empire – not lone handedly, to be sure, though he carried a tremendously heavy burden. It is to his lasting credit that the colleagues of father and son are guiding Dow to even greater heights. SDK

ELLWOOD HENDRICK, 1861-1930

Soon after I joined the staff in 1910 I met "my most unforgettable character." He appeared as though he had just stepped out of Dickens – definitely an old English gentleman of striking demeanor. And he could write the most delightful, whimsical, human interest essays that gave life and literary quality to our editorial pages. He was a gregarious soul and loved the company of his fellows, at conventions and dinners. But he could fall asleep and disturb the proceedings with astonishing vibrations of his soft palate. His books, "Everyman's Chemistry" and "Chemistry in Overalls" did much to promote better understanding of our science and industry. Truly Hendrick was unique in appearance, character and talents. HCP

CHARLES H. HERTY, 1867-1938

In 1920 he offered me a job with the "Industrial Journal," if and when it ever became as prosperous as a certain New York weekly. Sometimes I've been sorry I didn't offer to work for nothing! Certainly in my book there have been few greater men in the chemical profession. I met Dr. Herty at my first ACS meeting in Urbana, Ill. in 1915. I was with him in Washington during his successful fight for an American dye industry. I watched his great work for his native Southland in turning pine into paper. With thousands of other chemists and chemical engineers, I applauded all of the fine honors that came to him. He was a wonderful man, to whom truly we all owe much. **SDK**

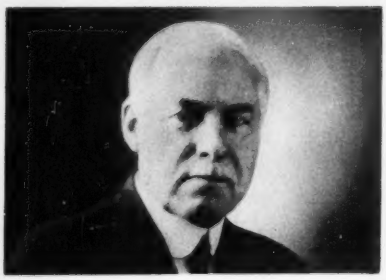
HENRY HOWARD, 1868-1951

"Every man, no matter how immersed in his work, should have a hobby. Sometimes he will not be able to tell when one commences and the others leaves off.... If you truly love your profession, there are no boundaries to it." Thus wrote this grand old man last year as he received the Perkin medal, near the very end of a long, fruitful career. Read his chapter in the Silver Anniversary Volume of A.I.Ch.E. for an insight into his work as a chemical engineer. Look up the scores of years he served MCA as a leader of the chemical industry. Read his books on sailing as a professional yachtsman. Respect and revere him for making our profession his hobby.

SDK

ALBERT E. MARSHALL, 1883-1951

Our profession, particularly in its formative period, was fortunate to have had a member like Bert Marshall. From the first time I saw him in action as chairman of the 1921 meeting of the Institute in Baltimore, I recognized him as a leader. He had rare ability to get things done, to inspire confidence in his decisions and judgment. He could be hard and impersonal, if needs be. But he was also the warmest of friends, loyal to the people and causes in which he believed, adamant against those who stood in the way of progress. Few chemical engineers have contributed more to our profession. **SDK**



SAMUEL W. PARR, 1857-1931

Some loyal Illini will argue that Parr was father of chemical engineering in the Middle West. They say he gave A. H. White and Harry McCormack their start in our profession. But the truth is, I'm afraid, that he came out second best in most of his arguments with the chemists. He was content to be called an industrial or engineering chemist. He preferred to apply his great talents to Illinois resources, particularly to coal and gas on which he became an international authority. As a boy I played in his back yard, later washed bottles in his lab. More than anyone else, he influenced me to study chemical engineering. That's why I worked so hard last year to see the new chemistry and chemical engineering building at Urbana dedicated in his name. **SDK**

WALTER S. LANDIS, 1881-1944

Thinking back over the years of our fairly intimate association, I'd say that Walter Landis' outstanding characteristic was his willingness to help anytime, anywhere in any worthwhile enterprise of the chemical profession. In the dark days of the depression he pushed ahead the vital relief work of the Chemists Advisory Committee. His knowledge of the economics of our industry made him our recognized spokesman and statesman. His 35 years as head of research and technology for Cyanamid gave him an international reputation. But to those of us who knew him best he was just a good, honest, hardworking fellow. He died as he chose to live – working tirelessly and unselfishly. SDK

CHARLES E. MUNROE, 1847-1938

We met first in the Cosmos Club before the old fireplace screen that so vividly reflects the results of the "Munroe effect." We did not realize then that twenty years later the principle of the shaped explosive would make possible the bazooka of World War II. Nor do many of our generation today know that Charles E. Munroe was also a great teacher and a pioneer in chemical market research. He was the first to organize, collect and interpret the chemical statistics of the U. S. Census of 1900. I worked closely with him as he wrote his classic article on the explosibility of ammonium nitrate, published in our March 22, 1922 issue. When he died at 89 he was the last survivor among 183 founders of the American Chemical Society. SDK

DAVID WESSON, 1861-1934

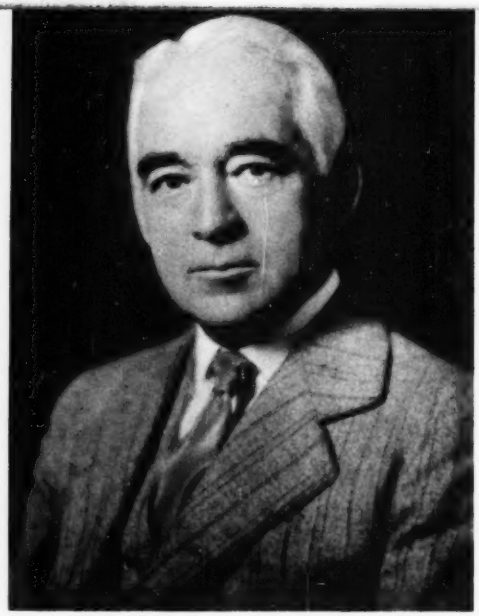
Our last meeting was in a little restaurant in East Orange, N. J. The father of Wesson oil had invited a small group of friends to sample his latest invention – synthetic beefsteak made from cottonseed meal. I've forgotten how it tasted, but I'll never forget the energetic, little old man who chuckled in his beard and was so proud that he had "made good" on a promise he gave me in 1933 when he wrote the chapter on vegetable oils for the Silver Anniversary Volume of A.I.Ch.E. He was one of the founding fathers of the Institute, and he never lost his enthusiasm for the profession. SDK

FREDERICK C. ZEISBERG, 1888-1938

From the time I first met "Zip" Zeisberg in 1919 when he was an assistant of Dr. Charles L. Reese in the Du Pont company until his tragic death a few days after he had ended his term as A.I.Ch.E. president, I had tremendous respect for his ability and courage. But most of all I admired him for his devotion to the profession, particularly for the perseverance with which he sought to improve the quality and value of its publications. The Wilmington-Philadelphia section of the Institute was truly inspired when it named its annual student paper awards after Fred C. Zeisberg. SDK

Reminiscences of WILLIAM H. WALKER

"Father of Chemical Engineering"



How a great teacher helped to shape the progress and development of the profession during the past fifty years is told by his colleague, Warren K. Lewis, professor-emeritus at the Massachusetts Institute of Technology.

THE YEAR this magazine was founded, half a century ago, William H. Walker started his career in engineering education by joining the faculty of the Massachusetts Institute of Technology as professor of applied chemistry. Twenty-five years later he contributed to the magazine's silver anniversary issue an account of the intervening development of chemical engineering. This fiftieth anniversary now offers an appropriate opportunity for an evaluation of Walker's personal contribution to education and to the profession of chemical engineering.

Walker had been trained as a chemist under Pond at Penn State and under Wallach at Göttingen. He had worked in industry for some years in the consulting firm of Little and Walker. Thus he brought to his task a chemical background, familiarity with chemical industry and understanding of its problems.

At that time, German chemical technology enjoyed an unrivalled prestige. The German industry used chemists for the development of its products and processes, but left full responsibility for design and construction of plant and equipment in the hands of mechanical engineers. Walker was convinced that the German system of education for technical leadership in the chemical industries was fundamentally unsound, —that leadership must be thoroughly grounded in both the chemistry and the engineering involved. He set out to develop this type of training at M.I.T.

A course in chemical engineering already existed at the Institute. Its curriculum was predominantly mechanical for it had been designed to train men for the bleacheries and dyehouses of the textile industry of New England. Walker took charge of this course and proceeded to transform its curriculum by greatly reducing the time devoted to the more detailed phases of mechanical engineering and introducing a solid groundwork of physical and organic chemistry. How rapidly he got into action is evidenced by the fact that a student design for a plant making barium chloride from barytes submitted as an exhibit at the St. Louis Louisiana Purchase Exposition of 1904 won gold medal recognition. The first instruction in physical chemistry in a formal curriculum in chemical engineering was given in 1905. By 1907 the full new curriculum, along essentially the lines universally followed today, was in effect.

During the nineteenth century emphasis had been devoted to the development of instruction in industrial chemistry. These courses were always introduced by a detailed description of equipment and operations common to many industries—the unit operations of today. This was followed by description of the methods and processes of specific industries. The instruction, particularly in unit operations, was entirely qualitative. Walker proceeded to expand and develop the instruction, but stressed primarily the underlying principles and their quantitative treatment. Thus he laid the foundation for the development of the method of instruction which today constitutes the core of chemical engineering education. Thereby Walker had cre-

ated a new method of training for technical leadership of the chemical process industries.

Walker was a proponent of education by doing. He appreciated fully the limitations of the lecture and classroom in developing the capacities of the student. He realized that engineering research is the most important and valuable technique of engineering education. He also knew how expensive that sort of training can be and, practical as he was in the approach to every problem, he devised a method for solving this one. He organized a program of industrial research in which he went to industry for cooperation and financial support. The work however was carried out in the laboratories of the Institute, under the direction of its staff.

Education in Research

Problems were submitted by the industrial organizations or chosen in cooperation with them. From the first the objective of the program was education in research. The work was therefore done by young engineers, who used the experience as a stepping-stone to industrial opportunity. The work was financed by the cooperating companies, who found reward for their participation in the research results of the programs which, although primarily the byproduct of its major objective, were always of sufficient practical value to justify the expenditures involved.

This was the Research Laboratory of Applied Chemistry. The work began in 1906; the formal organization of the laboratory came in 1908. It was successful from the start, so successful indeed that in 1920 the Institute organized its Division of Industrial Cooperation, the function of which was to extend the policy and methods of the Research Laboratory to all departments and phases of the Institute's work. Walker was given the task of organizing this broader program, but because of circumstances beyond control was forced to leave a few months later. The Division has expanded until it now constitutes an outstanding phase of the Institute's work. The Research Laboratory itself as a separate organization was allowed to lapse in the early 30's, but its program still continues under the aegis of the Division.

Walker's organization of the Research Laboratory of Applied Chemistry 45 years ago was the genesis of the modern development of industrial sponsorship of research in the universities and engineering schools. While its imitation in other institutions did not start for two decades, its growth, development, and acceptance in the last fifteen years constitute outstanding recognition of Walker's genius for facing a difficult problem and developing a practical solution, advantageous to all parties involved.

In December, 1915, Arthur D. Little proposed the program which developed into the Institute's School of Chemical Engineering Practice and he raised the funds to initiate it. To Walker was given the responsibility of organizing the school to implement Little's plans. This he did. Again the experience of the years has shown the wisdom of Walker's planning. Again widespread acceptance of the method by other institutions has been delayed, but the events of the recent past indicate that here too Walker's vision shows promise of winning nationwide adoption as an outstanding method of engineering education.

The development of human events may be profoundly influenced by circumstances which at the time seem irrelevant and unimportant. This was true of Walker's career in education. He had as colleague in the same department at the Institute another man of outstanding ability and personality,—Arthur A. Noyes, founder of the Institute's Research Laboratory of Physical Chemistry.

Interaction of Human Personalities

Noyes and Walker differed widely in temperament and point of view, but those very differences helped clarify the thinking and mold the attitudes and policies of each,—certainly of Walker. Their basic disagreement was in the matter of the philosophy of education. Noyes believed that training in pure science is not only the best possible basis for engineering work but the only basis needed. Walker was as insistent as Noyes himself on the importance of a thorough foundation in science, but was fully convinced that the application of science to industry is an art, training in which needs to be acquired by work under a master of the art itself.*

Otherwise, Walker found deep inspiration in his contacts with Noyes. Walker's educational pattern for the Laboratory of Applied Chemistry was based on that of Noyes' earlier Laboratory of Physical Chemistry, particularly in its integration of research and instruction. Walker admired Noyes' emphasis on basic principles and clarity of concepts. Noyes' development of the problem method of instruction was perhaps his greatest contribution to education; Walker transferred it to chemical engineering and by so doing guided that profession in a course that has been an outstanding influence on its development. The relations of the two men illustrate strikingly the potentialities in the interaction of human personalities.

Few indeed are the leaders in engineering education who have to their credit developments so diverse and so rich in fruitfulness in the educational world as the achievements of William Hultz Walker.

* * *

Why Walker Got Things Done

Dr. Robert E. Wilson, board chairman for Standard Oil Co. (Ind.), has an interesting sidelight on the conflicting viewpoints of Walker and Noyes. When asked for some personal reminiscences about the "Father of Chemical Engineering," he writes: "Probably the most crucial decision I ever made was between jobs which were offered me at identical salaries when I was graduated from M.I.T. One was to be a research associate in physical chemistry under Dr. A. A. Noyes, the other to be a research associate in applied chemistry under Dr. Walker. I had tremendous admiration for Noyes as a scientist and a great liking for both men as individuals.

"Although I realized that Dr. Walker was not in any sense a profound scientist, my decision was to go into

(Continued on page 178)

*This difference can be illustrated by an incident. Speaking one evening to a student meeting, Walker compared the methods and motivations of scientists and engineers by describing both as bridge-builders. The scientist, he said, builds for the pure love of building but the engineer builds to carry traffic. Hence the latter must face problems such as location and the type and scale of construction by which the former is unhampered. Noyes was so disturbed by the fear that the students would be overpersuaded by Walker's eloquence that the next day he spent the whole lecture hour on physical chemistry refuting the arguments of his engineering colleage. W.K.L.

Chemical Process Industries Pace the Nation's Economic Growth

Raymond H. Ewell, manager of the Chemical Economics Service, Stanford Research Institute, Stanford, Calif., forecasts still greater development at even higher rates in this illuminating article on trends during the 50 years ahead.

DURING THE PAST 50 YEARS the chemical process industries – those employing chemical raw materials and chemical engineering processes – have exhibited a growth rate materially higher than the average of all U. S. industry. This group includes the chemical manufacturing industry itself, and also the petroleum, rubber, pulp and paper, paint, pharmaceutical, soap, glass, textile dyeing and finishing, sugar refining, leather tanning, and other industries, having an overall production value of over $50 billion per year. Virtually all of the chemical process industries have had higher rates of growth than the average of the economy as measured by either the Index of Industrial Production or the Gross National Product.

Among the chemical process industries, the highest growth rate has been exhibited by the chemical industry itself, i.e., the industry which manufactures chemicals from the basic raw materials of coal, petroleum, natural gas, wood, molasses, sulphur, salt, and other minerals and natural materials. The chemical industry has had an average growth of about 9 percent per year during the past 25 years, and probably an even higher growth rate during the first 25 years of the century. By comparison, all U. S. industry, as measured by the Federal Reserve Board Index of Industrial Production, has grown at an average rate of only about 3 percent per year during the past 25 years.

The graph at the top of Fig. 1 illustrates the growth of the chemical industry during the past 50 years. The data for 1925-51 are based on the Stanford Research Institute Index of Chemical Production combined with an estimate of $5.6 billion chemical consumption in 1950. The earlier data are from U. S. Censuses of Manufacture during this period adjusted to the same basis as the 1925-51 data. Note, too, that these figures represent the *external* sales of the chemical industry, i.e., to other industries or to foreign countries, and do not include sales of chemicals from one company to another within the chemical industry. The data, therefore, represent the value of the end-products of the chemical industry. They are in terms of dollar values, *if the products had been sold at 1950 prices*, and are, therefore, in terms of a "chemically standardized dollar." Gross chemical production would be larger than, but approximately proportional to external sales.

Table I. Growth Rates of Major Industries

Industry	Unit	1929	1950	Ratio 1950/1929	Corresponding Average Annual Rate of Growth
Air transportation	Passenger-miles X 10^6	31	7,955	256.6	30.3%
Aluminum	Thousands of tons	112.5	718.6	6.39	9.2%
CHEMICALS	S.R.I. Index of Prod.	69.1	415.3	6.02	9.0%
Electric Power	Billions of k.w.h.	117	389.0	3.32	5.9%
NATURAL GAS	Trillions of cu. ft.	1.92	6.28	3.27	5.8%
PETROLEUM	Bbls. consumed X 10^6	940	2,375	2.53	4.5%
RUBBER	Long tons consumed X 10^3	680	1,562	2.30	4.0%
PAPER	Millions of tons	11.1	24.3	2.19	3.8%
Machinery	F.R.B. Index of Prod.	130	270	2.08	3.5%
PAINT	Millions of gallons	301	599	1.99	3.3%
Transportation equipment	F.R.B. Index of Prod.	134	261	1.95	3.2%
GLASS	Millions of tons	3.04	5.90	1.94	3.2%
ALL MANUFACTURING	F.R.B. Index of Prod.	110	209	1.90	3.1%
ALL INDUSTRY	F.R.B. Index of Prod.	110	200	1.82	2.9%
GROSS NATIONAL PRODUCT	1950 dollars X 10^9	157.4	282.7	1.80	2.8%
Tobacco	Millions of pounds	797	1,397	1.75	2.7%
Textiles	Fibers consumed lb. X 10^9	4.02	6.83	1.70	2.6%
Steel	Millions of tons	63.2	96.7	1.53	2.0%
Agriculture	B.A.E. Index of Prod.	99	137	1.38	1.6%
Mineral products	F.R.B. Index of Prod.	107	148	1.38	1.6%
Furniture	F.R.B. Index of Prod.	135	183	1.36	1.5%
Food processing	All Foods consumed, lb. X 10^9	190	246	1.29	1.2%
Construction	1939 dollars X 10^9	10.2	12.7	1.25	1.1%
POPULATION	Millions of persons	121.8	151.7	1.25	1.0%
SOAP AND DETERGENTS	Billions of pounds	3.23	3.57	1.11	0.5%
LEATHER	Equivalent cattle hides X 10^6	34.95	36.00	1.03	0.1%
Lumber	Billions of board feet	38.7	38.0	.98	–0.1%
Nonferrous metals*	Millions of tons	2.78	2.66	.96	–0.2%
Coal	Millions of tons	608.8	556.4	.91	–0.4%

*Primary copper, primary lead, and slab zinc.

"Chemical industry," as the term is used in this article, means the industry which manufactures acids, alkalis, salts, solvents, pigments, dyes, medicinal chemicals, synthetic plastics, synthetic fibers, synthetic rubber, fertilizers, insecticides, explosives, antiknock agents, and other categories of synthetic chemicals. The "chemical industry" may also be defined as the industry composed of companies such as Du Pont, Union Carbide, Allied Chemical and Dye, Dow Chemical, Monsanto Chemical, Hercules Powder, Mathieson Chemical, Diamond Alkali, Pennsylvania Salt, Davison Chemical, and American Potash.

Since these companies are large producers of synthetic plastics, synthetic fibers, fertilizers, explosives, antiknock agents, etc., all companies whose major business is in such products must be included in the chemical industry, e.g., American Viscose, Industrial Rayon, Atlas Powder, Ethyl Corp., *et al.* Also a part of the "chemical industry" are the chemical divisions of companies whose principal business is not chemicals, such as Eastman Kodak, General Electric, Shell Oil, U. S. Rubber, etc. The number of companies in the chemical industry with over $2,000,000 per year sales is about 175 by this definition, and this group would comprise over 98 percent of the total sales of the chemical industry.

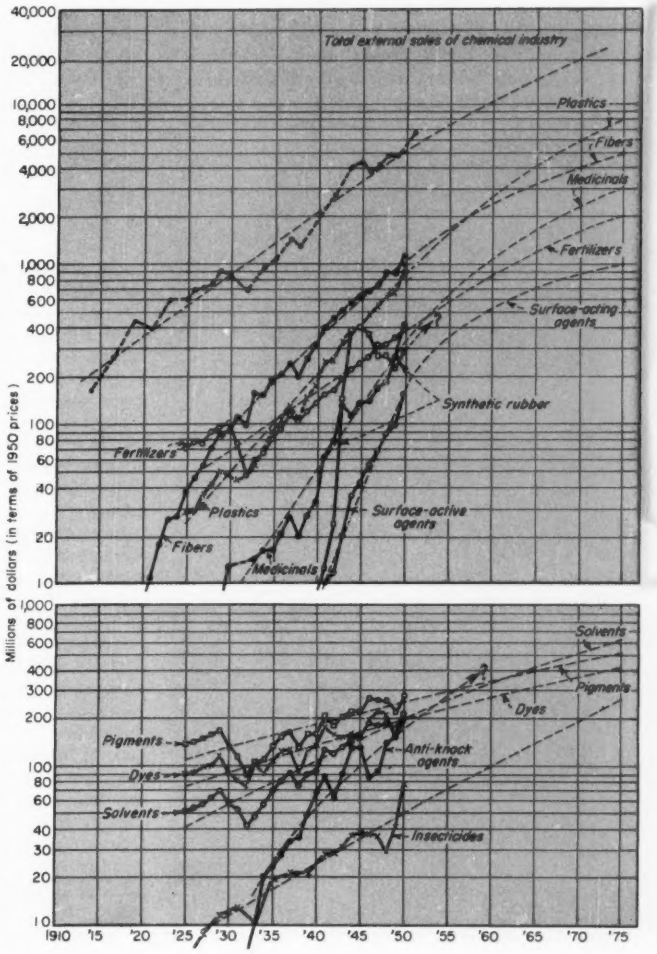
Growth of Other Industries

Table I shows a comparison of the growth rate of the chemical industry with other major industries, including most of the major components of the chemical process industries group. The figures given in Table I are ratios of 1950 to 1929, measured in terms of physical volume of production (not in dollars). The 1950/1929 ratio is used for comparative purposes rather than the slope of a trend curve since straight trend-lines are open to considerable question and data were not available for growth-equation curves for all of the industries shown in Table I.

Note the high growth rate of the chemical industry compared with other major industries and with other industries in the chemical process industries group. Chemicals at 9 percent per year average growth rate stands far above the leading dollar-value industries such as food processing, steel, machinery, transportation equipment, petroleum, and textiles. Some of the major chemical process industries, petroleum, rubber, paint, paper and glass, are grouped in the range of 3.2 percent to 4.5 percent per year. The high growth rate of electric power production, 5.9 percent per year, is rather surprising.

Among the industries in Table I only air transportation and aluminum have higher growth rates than the chemical industry and each of these is much smaller in dollar value than the chemical industry. Moreover, air transportation and aluminum cannot be considered as separate basic industries, but rather as components of the transportation and non-ferrous metals industries, respectively. There are four additional industries or segments of industries which have higher growth rates than the chemical industry, namely, television equipment manufacturing, television broadcasting,

Fig. 1—Sales of Chemical Industry and Dollar Values of Major End-Chemical Groups



RAYMOND H. EWELL, 1908-

Trained as a physical chemist (M.S. Purdue, 1930 and Ph.D. Princeton, 1937), Dr. Ewell served as senior technical aide in the Chemical Engineering Division of NDRC during the war. He was awarded the Medal of Merit for his key role in developing incendiary bombs and flame throwers. From 1945 to 1948 he was senior chemical economist for Shell Chemical in San Francisco. He joined Stanford Research Institute as chairman of chemistry and chemical engineering research, later becoming manager of SRI's Chemical Economics Service. Outside of hours he is a gourmet and wine connoisseur of note, author of a local best-seller "Dining Out in San Francisco."

air-conditioning, and frozen foods. However, each of these is much smaller than the chemical industry in dollar value and none of them has a history going back as far as 1929.

Although the chemical industry has the highest growth rate of any major industry, in absolute magnitude the chemical industry stands in ninth place among U. S. industries. Table II shows the 1950 sales volumes of the chemical industry and other major industries. The sales figure for the chemical industry given in Table II, $7.2 billion, represents the *total* sales of the industry, including sales of chemicals from one chemical company to another. In other words, this figure would be the total sales of all chemical companies, including both intra-industry and extra-industry sales. This is an estimated figure and may be in error by as much as $0.5 billion in relation to the external sales figure of $5.6 billion. The growth rate of the chemical industry is so high that it seems certain to exceed the textile and apparel industries some time during the next 25 years, thereby moving into seventh place. However, it seems unlikely that the chemical industry will move any higher than seventh place during the next 25 years, although within the next 50 years it could conceivably move up to second place, even ahead of agriculture.

Table II. Comparative Magnitudes of Major Industries*—1950

(Data are Manufacturers' Sales, except agriculture, which is cash farm income, and coal, which is total value of coal mined.)

	Billion Dollars
1. Food and beverages	41.4
2. Agriculture	29.1
3. Machinery	27.8
4. Iron, steel, and products	26.1
5. Transportation equipment	21.8
6. Petroleum products	18.7
7. Textile mill products	13.7
8. Apparel	10.5
9. CHEMICALS	7.2
10. Lumber and other basic wood products	6.9
11. Paper and allied products	6.8
12. Nonferrous metals and products	6.5
13. Furniture and other finished wood products	4.8
14. Rubber products	4.4
15. Leather and products	3.6
16. Coal	3.5
17. Tobacco manufactures	3.3
18. Pharmaceuticals and toilet preparations	2.0
19. Paint	1.3
20. Glass	1.3
21. Soap	1.2
22. Ceramics	1.0

*Except transportation and public utilities.

Forecasting Future Growth

The forecasts in this article are presented only as reasonable statements of the future, and insofar as possible, objective methods have been used in arriving at them. A forecast is not necessarily a prediction. A forecast need only be reasonable and objective in its method of deduction (insofar as possible), but presumably a prediction is supposed to be true.

Forecasting the future growth of the chemical industry has proved to be more difficult, and somewhat less objective than is usually the case, since it was impossible to fit any of the standard growth equations* to the data. It was assumed, despite an apparently straight-line growth trend for 47 years, that the chemical industry will experience a gradually declining percentage growth rate during the next 50 years, and that the trend curve will become slightly concave downward as indicated at the top of Fig. 1. The chemical industry has grown largely by replacement of natural materials, particularly during the past 25 years, and this type of growth will gradually, but inevitably, approach saturation sooner or later.

The forecast of $25 billion in 1975 was based on this general approach combined with a detailed study of the growth of 11 major end-chemical groups and the relationship of these 11 end-chemical groups to the total chemical industry. A forecast of $65 billion in 2000

*In our program of trend-curve studies at Stanford Research Institute, we have found the Gompertz equation ($\log y = k + ab^x$) to be the most generally useful in studying the growth of chemicals and related products. Other widely used growth equations are the Pearl-Reed, or logistic equation, and the modified exponential equation. RHE

Here's tangible evidence of chemical growth during the past quarter century. Blaine Island in the Kanawha River at South Charleston, W. Va. is shown in 1925 just before Carbide and Carbon Chemicals Co. began building its huge plants, offices, and research laboratories. Today this is the world's largest petrochemical works.

is more of a guess and is based primarily on a continuation of the declining percentage growth rate. However, even in 2000 the growth rate of the chemical industry is still assumed to be much higher than the overall manufacturing production growth rate, and, of course, much higher than population growth rate.

Table III summarizes the consumption of chemicals by chemical-consuming industries in 1950. The textile industry is the largest consumer of chemicals, followed by the rubber industry, paint industry, agriculture, plastics-fabricating industry, petroleum industry, and others. Looking again at Table I, we see that these big consumers of chemicals all have far lower growth rates than the chemical industry. In fact, the only one of the 23 chemical-consuming industries listed in Table III which has a higher growth rate than the chemical industry is the plastics-fabricating industry. As close as we have been able to ascertain, it has a growth rate of 12-15 percent per year.

How then has the chemical industry been able to maintain an average growth rate of 9 percent per year when all of its customers, except the plastics-fabricating industry, have growth rates from −0.2 percent to 4.5 percent? The answer is that the chemical industry has grown to a considerable extent by replacing traditional natural materials with new synthetic products. However, replacement markets have not been the only mechanism of growth of the chemical industry. Many of the important end-chemical groups owe their growth to the development and expansion of new markets where they are not replacing other methods. Outstanding examples of chemical products which have grown largely by developing new markets are: medicinal chemicals, particularly antibiotics; fertilizers, insecticides and other pesticides; antiknock agents, refrigerants, lubricating oil additives, and chemical catalysts.

The "replacement" type of growth has been a more important factor in the growth of the chemical industry than the "new market" type of growth, particularly during the past twenty-five years. This will continue to be the case for many decades yet. However, the "new market" type of growth will play an increasingly important role as time goes on and will eventually be the dominant factor, as the various markets for replacement of natural materials approach saturation.

Table III. Consumption of Chemicals by Chemical-Consuming Industries—1950

	Millions of Dollars
1. Textiles	1,140
2. Rubber	610
3. Paint	575
4. Agriculture	525
5. Plastics-fabricating industry	400
6. Petroleum industry	350
7. Pharmaceutical industry	250
8. Food and kindred products	250
9. Soap and cleansers	110
10. Mining and smelting	100
11. Metal fabricating industries	95
12. Pulp and paper	90
13. Automobile servicing	80
14. Leather	60
15. Lumber and wood products	50
16. Glass	40
17. Laundry and dry cleaning	35
18. Water treatment	35
19. Photography	35
20. Floor coverings	30
21. Toilet preparations and cosmetics	25
22. Household products	25
23. Ceramics	15
24. About 25 additional chemical-consuming industries (including manufacture of military material)	375
Total consumption of chemicals by United States industries	5,280
Imports of chemicals	200
Consumption of domestically-produced chemicals by United States industries	5,000
Exports of chemicals	600
Total sales of chemicals by United States chemical industry (to industries outside the chemical industry or to foreign countries	5,600

Table IV. Dollar Values of End-Chemical Groups—1950

(Synthetic products only)

	Millions of Dollars
1. Fibers	1,180
2. Plastics and resins	950
3. Medicinal chemicals	420
4. Fertilizer materials	390
5. Elastomers	285
6. Pigments	280
7. Solvents	220
8. Dyes	205
9. Anti-knock agents	182
10. Surface-active agents	153
11. Explosives and propellants (non-military)	150
12. Alkalis for miscellaneous purposes	90
13. Insecticides	75
14. Lubricating oil additives	70
15. Acids for miscellaneous purposes	65
16. Anti-freezes	60
17. Rubber-processing chemicals	57
18. Bleaching chemicals	45
19. Catalysts	45
20. Refrigerants	40
21. Wood preservatives	37
22. Glass-making chemicals	35
23. Flavor chemicals	24
24. Photographic chemicals	22
25. Perfume chemicals	20
26. About 55 additional end-chemical groups	590
TOTAL, ALL END-CHEMICAL GROUPS	5,680

Table V. Use Breakdown of Synthetic Plastics and Resins—1950

(Including cellulosic plastics, film and lacquer base)

	Million Pounds
Molding and casting	886
Surface coatings	686
Adhesives	138
Laminating	96
Treatment of textiles, paper and leather	93
Film (except cellophane), sheeting, rods, tubes, insulation, ion exchange resins, and miscellaneous other applications of synthetic plastics*	622
Cellophane	260
	2,781

*Includes 190 million pounds of plasticizers for vinyl films.

Table VI. Consumption of Plastics and Some Competitive Materials—1950

	Million Short Tons
Steel	96.7
Lumber	50.7
Cast iron	13.8
Glass	5.5
Textiles	2.19
Rubber	1.75
Brass and bronze	1.63
Ceramics	1.48
Leather	1.08
PLASTICS*	0.85
Aluminum	0.72

*Including all types of plastics materials except those used for surface coatings and for treatment of textiles, paper and leather. The principal types included are molding and casting materials and plastic film, sheets, rods and tubes, i.e. the types of plastics materials which are used to make "things." Cellophane is excluded.

Table III presented a summary of the consumption of chemicals in terms of the industries which consumed them. Another illuminating approach is to consider the consumption of chemicals in the terms of chemical groups. An end-chemical group may be defined as a group of natural and/or synthetic products which compete for a given end use, irrespective of their origins or chemical natures. For example, the end-chemical group "fibers" includes cotton, wool and other natural fibers, and rayon, acetate, polyamides, polyesters, and other types of synthetic fibers. The end-chemical group "pigments" includes the natural and synthetic iron oxide pigments, the various chrome pigments, white lead, titanium dioxide, ultramarine, and other inorganic pigments, and also the organic lakes and toners. However, the discussion of end-chemical groups in this article will be restricted entirely to synthetic products.

Consumption by End-Chemical Groups

The materials in any end-chemical group may be consumed entirely by one industry or by several different industries. For example, antiknock agents are consumed entirely by the petroleum industry. On the other hand, pigments are consumed by the rubber, paint, paper, floor coverings, ceramics, printing ink and other industries.

Table IV presents a summary of the dollar values of the end-chemical groups in 1950. The total dollar value shown in Table III, $5.6 billion, represents the total external sales of chemicals by the chemical industry. Most of this total is represented by clearly defined end-chemical products such as fibers, plastics, fertilizers, pigments, and solvents. However, there is a residue of miscellaneous chemicals which are sold to other industries, such as sulphuric acid to the petroleum industry, caustic soda to the soap industry, which have to be put in miscellaneous categories. We can arbitrarily define a product as an end-chemical if it is sold by the chemical industry to another industry or exported to a foreign country. One of the purposes of this approach is to eliminate the sales of intermediate products from one company to another within the chemical industry.

Fig. 1 presents the growth data up to 1950 for 11 of the principal end-chemical groups. These are all put on the basis of dollars in terms of 1950 prices as the best common denominator for comparing the relative sizes and growth rates of the end-chemical groups. The figure given for each end-chemical group each year is the dollar value in that year if all the products had been sold at 1950 prices.

Fig. 1 shows synthetic plastics going around synthetic fibers within the next 10 years to become the largest end-chemical group. Likewise, the chart shows medicinal chemicals going around fertilizers to become the third largest end-chemical group. The projected growth of synthetic rubber and antiknock agents are shown as questionable since the future of these two end-chemical groups is difficult to forecast.

Synthetic Plastics. It seems quite certain that synthetic plastics will ultimately be the largest end-chemical group and, in fact, may ultimately grow to be nearly half of the total output of the chemical industry. Synthetic plastics have had a comparatively high growth

rate, namely, about 15 percent per year during the past 25 years, which is exceeded in growth rate only by medicinal chemicals and synthetic surface-active agents. An even more important factor is that synthetic plastics are steadily replacing a wide variety of traditional materials, which totalled about 170,000,000 tons in 1950, compared with the 1950 production of competitive synthetic plastics of only 850,000 tons. Plastics, therefore, have such a tremendous potential market that they should continue to grow at a high rate.

Table V shows the use breakdown of synthetic plastics and resin materials in 1950. All of these uses of synthetic plastics, except surface coatings, treatment of textiles, paper, and leather, and cellophane, can be considered as "structural materials," i.e., materials used to make "things"—all the way from ash-trays to vacuum cleaners to automobile parts to boats. In many of these applications plastics compete with steel, lumber, cast-iron, glass, textiles, rubber, brass, ceramics, leather, aluminum, magnesium, and still other "structural materials." Table VI shows the relative magnitudes of some of these competitive materials.

In the surface coatings field, synthetic resins have been displacing natural resins for over 30 years. The replacement process is now nearly complete as shown in Fig. 2. However, surface coating resins are still growing at a much higher rate than paint, since more and more resins are being used per gallon of paint.

Synthetic Fibers. Synthetic fibers are experiencing a great expansion at the present time. However, their ultimate market does not loom as large as the ultimate market for synthetic plastics. Synthetic fibers are rapidly replacing natural fibers, including both wool and cotton, and the synthetic fibers as a group will undoubtedly exceed natural fibers within the next 20 to 25 years. However, ultimate saturation of the market is inevitable, and for this reason the future growth of synthetic fibers is shown in Fig. 3 with a much lower growth rate than synthetic plastics. Fig. 4 shows a possible picture of future consumption.

Surface-Active Agents. The big factor in the growth of synthetic surface-active agents has, of course, been synthetic detergents. These have now replaced soap to the extent of about 40 percent and their consumption is still rising at a high rate. However, just as in the case of fibers, there is a definite and foreseeable ceiling to the consumption of soap and synthetic detergents. Within the next 25 years, this ceiling appears to be in the range of 3.5-4 billion pounds. Fig. 5 shows a possible picture of the future consumption of soap and synthetic detergents, in which we assume that synthetic detergents replace soap to the extent of 75 percent by 1975.

However, this will not be the total market for all synthetic surface-active agents since there are many uses of synthetic detergents being developed which do not replace soap, and these uses would be added on to the consumption of detergents as soap replacement. In addition to the detergent uses of surface-active agents, there are a number of potentially important non-detergent uses. One of the most thought-provoking of these is the use of surface-active agents for secondary recovery of petroleum.

Fig. 2—Consumption of Natural and Synthetic Resins in Production of Surface Coatings

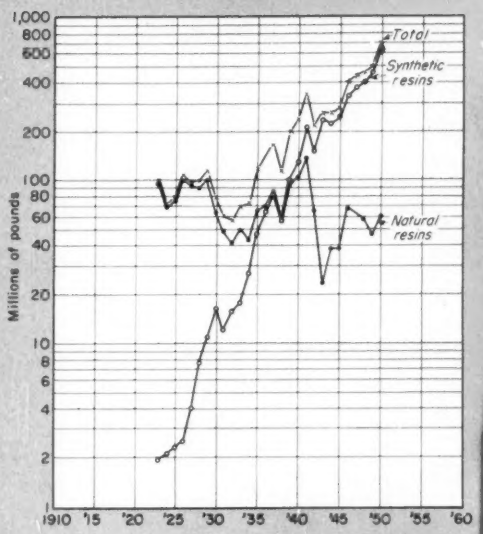


Fig. 3—Consumption of Textile Fibers

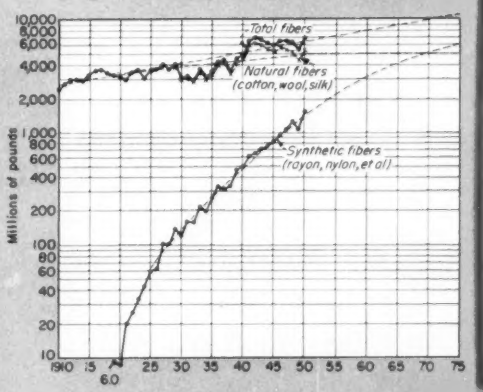
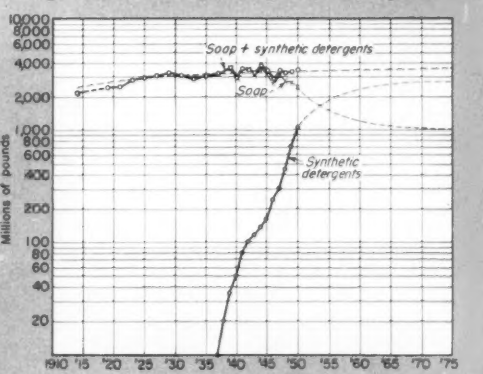


Fig. 4—Sales of Soap and Synthetic Detergents



BUILDING THE LITERATURE
of Chemical Engineering

"Of making many books, there is no end." Yet for each there must be a beginning – even for the books and magazines of the chemical engineering literature. So, it will be our purpose in the pages that follow to go back to some of the beginnings of the literature of this Chemical Century, to appraise as best we can the motives as well as the vision and courage of the men most responsible for its earlier development and, finally, to show, if possible, how the recorded results of progress have helped to clear the way for future advances and achievements.

Our story begins with a group of 52 chemists and engineers who met in Philadelphia April 3, 1902, in search of a "common medium of communication." Their prime interests were in the burgeoning electrochemical industries whose annual production had already exceeded the startling value of $100 million. Among them were such distinguished men as Edward G. Acheson, Lawrence Addicks, Wilder D. Bancroft, Frederick M. Becket, Charles F. Burgess, Herbert H. Dow, Charles M. Hall, Carl Hering, Dugald C. Jackson, Victor Lenher, Joseph W. Richards, Samuel P. and Samuel S. Sadtler, Elmer A. Sperry, N. Tesla, Frank J. Tone, Charles A. Stone, E. S. Webster, Edward Weston, and Willis R. Whitney.

These men joined with others that day in Philadelphia to found the American Electrochemical Society. Within the next few years were added as members such eminent leaders as Leo Hendrik Baekeland, Thomas A. Edison, Charles P. Steinmetz, William H. Nichols, J. G. White, Elihu Thomson, Maximilian Toch and David Wesson. Such was the galaxy of great pioneers who were banded together at the beginning of this century by their common interests in chemistry and engineering.

Two leaders of the organizing group were Prof. Joseph W. Richards of Lehigh University, then vice-president of the American Chemical Society, and Carl Hering, consulting engineer and former president of the American Institute of Electrical Engineers. Hering, in particular, felt the need for a publication that might serve as an exponent of the new electrochemical industry. For several years he had been a consulting editor for *Electrical World*, and to help in the abstracting of current literature he had engaged the services of Dr. E. F. Roeber, a brilliant young German scientist and engineer as well as a skilled linguist. Seeking further advice on their publishing problem, Richards, Hering and Roeber turned quite naturally to Capt. W. D. Weaver, editor of *Electrical World*, and through

him to James H. McGraw, its owner and publisher.

The first proposal was that a new magazine should be established as an official organ of the American Electrochemical Society, whose membership would be pledged to its support. But it is worthy to note that even at that early date Mr. McGraw had become convinced of the soundness of independent journalism, free from official affiliations with any scientific or trade organization. Although the wisdom of his views was accepted by the proponents, they nevertheless impressed upon Mr. McGraw the logic of entering the electrochemical field with a sister publication for *Electrical World*.

Several months elapsed before the decision was reached to launch the new publishing venture. In June 1902 Mr. McGraw incorporated the Electrochemical Publishing Company with Dr. J. W. Richards as its president, and on September 1, 1902, Vol. 1, No. 1 of *Electrochemical Industry* appeared with Dr. E. F. Roeber as editor. In his first editorial "Greeting" he pledged to make the new journal "an authoritative exponent of electrochemical science and its various applications in industry . . . Unhampered by precedent . . . its pages will satisfy in the most complete manner possible the needs of all interested, whether in the science or in the art of electrochemistry."

In June 1903 the offices of *Electrochemical Industry* were moved to 114-18 Liberty Street in New York. The editor remarked of his regret to leave "old and beautiful Philadelphia," but recognized the fact that "a technical newspaper which endeavors to be a newspaper in the best sense of the word can only in the highest degree discharge its functions by keeping constantly in touch with the men alongside of the facts – those who make the history of the industries of this country."

Thus, very early in its career, *Electrochemical Industry* set down as a guiding principle the necessity for "keeping constantly in touch" with those who make the history of our industry and profession.

From the very start the new magazine was markedly successful. In one of his few references to the progress of the publication, Dr. Roeber noted in June 1903 "We doubt whether any technical journal has ever acquired in such a short time a subscription list so fully representative of an art and an industry." And the electrochemical industry was already broadening, so that Dr. Roeber found it necessary "to take account of new chemical and metallurgical developments with which electrochemical products may have to compete or which may react in some essential way on that industry." This was reflected in January 1905 when the name of the magazine was changed to *Electrochemical and Metallurgical Industry*."

The next five years were exceedingly important to the magazine and to the budding profession it was to serve. More and more the emphasis was shifting toward engineering, particularly toward the operations and processes that were common to so many industries. Dr. Roeber early recognized in this the broadening field of chemical engineering and in January 1910 the title *Metallurgical and Chemical Engineering* was adopted to reflect the changing policies.

Here is how he expressed it editorially:

Engineers . . . as well as manufacturing chemists engaged in engineering practice in industrial establishments of all kinds are more or less interested in the same processes – in crushing and grinding, concentration and separation, drying and evaporating, filtration, calcination, combustion, furnace operation, fusion welding, in the measurement and control of temperatures, in chimney draft and forced draft and in a hundred other lines of work.

Thus Roeber expressed in 1910, somewhat crudely to be sure, the beginnings of the unit-process-unit-operation concept that was to be formulated five years later in the writings of William H. Walker and Arthur D. Little.

But 1910 was also important because on March 15 of that year Howard C. Parmelee joined the staff as Western editor with his headquarters in Denver. A chemical graduate of the University of Nebraska, he brought the magazine a unique combination of industrial and journalistic experience. From 1900 to 1902 he had been chief chemist at the Globe smelter of American Smelting & Refining Co. Following three years as a consultant, he edited the *Mining Reporter* until 1906 when he was made editor of *Western Chemist and Metallurgist*. The move to *Metallurgical and Chemical Engineering* was, therefore, not too difficult. But it marked the beginning of a long and fruitful association – continuous from 1910 to 1928, except for the academic year 1916-17 when Dr. Parmelee (hon. Sc.D. Colorado College) served as president of the Colorado School of Mines.

I remember . . .

JOSEPH W. RICHARDS, 1863-1921

Long before we met his name had become, to me, synonymous with metallurgical calculations. His notable articles on this subject first published in this magazine and later as a McGraw-Hill text, were my bible as Western Editor. Later I came to know him as a man of cheerful disposition whose small stature belied his boundless energy. He had a fertile, active mind and many of his ideas were embodied in *Electrochemical Industry* and its several successors. For years, with seemingly inexhaustible energy, he played the diverse roles of teacher, publisher and society secretary. Work might well have been his middle name. **HCP**

I Remember...

EUGENE F. ROEBER, 1867-1917

He was German in appearance, with his *professorenhut* and thick lenses; German in his accent, which he never overcame; and German in his painstaking thoroughness and accuracy. But Dr. Roeber was not the traditional proud Prussian. On the contrary he was sensitive, modest, and even shy, sometimes hiding embarrassment only with great effort. By dint of hard work he acquired skill in the use of the English language, and became a capable, qualified editor who early established his journal's reputation for editorial integrity. "Chem & Met" and its predecessors reflected his devotion to science and engineering with little concern for modern requirements of typography and layout. Typical of the man, he lived and died in his work.

HCP

It is a significant and historical fact that many of the best-known and most widely used chemical engineering processes and equipment had their origin in Western metallurgical practice. Ore dressing and hydrometallurgy were the proving grounds for crushing and grinding, leaching, classification, filtration, sedimentation, agitation and other unit operations.

Gradually an evolution was taking place which Drs. Roeber and Parmelee hailed as "the emancipation of the metallurgist from the mining engineer, the dissociation of the chemical engineer from the chemist." The pages of *"Met & Chem"* accurately reflected these changes. Although still dominantly metallurgical in editorial content, there was an awareness to the events that forecast an even greater development of the chemical industries.

The world war that started in Austria in 1914 brought with it unprecedented demands on American chemical manufacturers. In harmony with the increasing tempo of its field, semi-monthly publication was begun in September 1915. The journal prospered but its editor was sorely tried. Remember, Dr. Roeber was German born, and although he had applied for American citizenship, his papers were still in process when the United States entered the war. But despite his old world origin and associations, his loyalty to the United States was never questioned. This is evident from an editorial on "Patriotism in Chemistry" which he wrote shortly after we entered the war: "We must stand by the President and . . . be ready to serve with hearts and heads and hands and fortunes. . . . The first requirement is chemical and metallurgical organization. . . . Chemists who can do productive work in making munitions should be restrained from enlisting to serve with the colors. It is patriotism turned upside down for a young man who is familiar, for instance, with nitration processes to march behind the band . . . The chemists of the United States have suddenly become, in a large measure, the trustees of her safety. Let us not fail."

History records that the chemical profession did not fail. But the burden of the war rested all too heavily on Dr. Roeber. Badly in need of rest and recuperation, he gave up his active editorial work in June 1917 and retired to the Battle Creek Sanitarium where he died four months later. He was only 50 years old, but in 15 years of what he loved to call "militant journalism" he had risen to a position of editorial leadership. He had established high standards for those who were to follow.

Another event that had a marked influence on the development of this magazine was the merger in March 1917 of the McGraw Publishing Co. and the Hill Publishing Co. The book departments of these two independent publishers had been consolidated in 1909, but the magazines of the parent companies had continued to serve some of the same fields of engineering and industry. To avoid conflict with *Engineering and Mining Journal* in the field of Western metallurgy, *Metallurgical and Chemical Engineering* soon directed its attention to the field of physical metallurgy.

Ernest E. Thum, who had been professor of metallurgy at the University of Cincinnati and is now the distinguished editor of *Metal Progress,* joined the staff as associate editor. Under his guidance *"Met & Chem"* became the leading exponent of physical metallurgy. Its early articles recorded many of the outstanding advances in both theory and practice. But the great stimulus the war had given to chemical engineering led the publishers to rearrange the name of the magazine in June 1918 to *Chemical & Metallurgical Engineering.* And in October 1919 the semi-monthly was changed to a weekly publication.

Meanwhile, Dr. Parmelee, who had returned to the fold late in 1917 after his "sabbatical" year as a college president, was appointed editor in October 1918. For the next ten years his constructive leadership was responsible for many advances in building both the magazine and book literature of chemical engineering.

"Chem & Met" soon became the vigorous exponent of chemical engineering in industry – the first to recognize, interpret, and expound the modern concept of the unit operations and unit processes. Entire issues were devoted to such timely themes as putting the process industries on a scientific basis, the elimination of waste in industry, combatting corrosion with new materials of construction for severe service conditions.

In 1924 the first Annual Review and Statistical number reflected the increasing importance of the economic aspects of chemical industry. The foundations for this

Howard C. Parmelee
Editor, 1917-28

Sidney D. Kirkpatrick
Editor, 1928-50

John R. Callaham
Editor, 1950

change in editorial emphasis had been forecast by earlier additions to the editorial staff. Russell S. McBride had resigned from the U. S. Bureau of Standards in January 1920 to become an editorial and chemical engineering consultant. Sidney D. Kirkpatrick, who had served with Professors F. W. Taussig and Grinnell Jones in the chemico-economic work of the United States Tariff Commission was appointed assistant editor in June 1921. Henry M. Batters and Hans Wanders, experienced market editors, joined the staff in 1923. A year later Chaplin Tyler, who had previously contributed articles on chemical engineering economics while at M.I.T., became an assistant editor. This was the organization behind Dr. Parmelee in March 1925 when he made this forthright statement of the editorial policies and principles that were to guide the 23-year-old magazine as it resumed monthly publication:

Chem. & Met. is a magazine of opinion written for that large group of men who are responsible for production and administration in the chemical engineering industries. Thus its major editorial field is the technology and economics of those industries; the goal of its efforts is production efficiency and business success. On this platform the magazine becomes a common meeting ground for the fabricator of chemical engineering equipment, the producer of commodities that form the raw materials or finished products of various industries, the buyer and seller, the engineer, the plant operator, the business executive.

"We believe in chemical engineering in industry; in the intelligent application to production methods of chemical, physical and mechanical principles. We believe in the efficiency, economy and ultimate profit of engineering methods; in the displacement of manual labor by mechanical handling; in the use of modern engineering equipment and automatic control; in the development of continuous processes wherever possible. We believe in the direct and beneficent influence of these factors on national prosperity and individual standards of living.

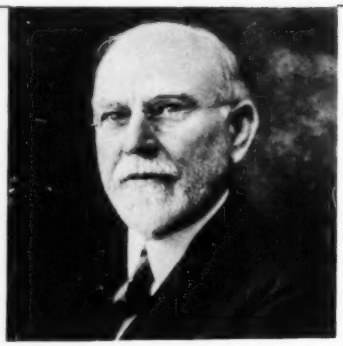
"We believe in extensive and intensive application of the engineering method – the determination of facts and their honest interpretation – not only in research, development and production, but also in those more neglected but equally important phases of business – purchasing, marketing, management and financing. We believe in thus forestalling the element of surprise in business; in eliminating the casual; in substituting knowledge for 'hunch.'

"We believe in the conservation of material resources through intelligent use; in the elimination of waste from our industrial life and the conversion of byproducts into useful and profitable commodities. As exponents of technical publicity we believe in the open exchange of technical information, knowing from observation and experience that industrial progress is thereby advanced by leaps and bounds. We abhor and expose the industrial charlatan as the enemy of honest chemical engineers.

"Finally, and fundamentally, we believe in chemical engineering education and industrial research as two great factors that will banish empiricism and rule-of-thumb from industry and place it on the firm foundation of science and engineering."

Building on these foundations, the monthly magazine found increasing opportunity to serve the chemical process industries. Appointment of Dr. Paul D. V. Manning as Pacific Coast editor brought into sharper focus the expanding frontiers of our technology. A series of regional studies of raw material resources and markets contributed to the steady advance of our industries in the Far West and along the Gulf Coast, in the South and Southwest. Meanwhile, chemical engineering was also making progress in its penetration into many older plants and industries that had formerly depended on rule-of-thumb methods or equipment.

When Dr. Parmelee was appointed editorial director of McGraw-Hill in 1928 the editorial portfolio was passed to Sidney D. Kirkpatrick, associate editor. He had prepared himself for this position through more than seven years of association not only with Dr. Parmelee but also with James H. McGraw, the magazine's founder and first publisher. The latter had been succeeded in 1910 by Malcolm Muir, now president and publisher of *Newsweek*. M. A. Williamson, who had joined the business staff in 1920, was made publishing director of *Chem. & Met.* in November 1928 and later vice president and director of McGraw-Hill Publishing Co. He was succeeded in November 1949 by Wallace



I Remember...

JAMES H. McGRAW, 1860-1948

Those of us who were privileged, as I was, to work with the founder and first publisher of this magazine, gained most from his strength and example. He set high standards for himself and all those associated with him. His dissatisfactions were many, but they were always wholesome and stimulating. There was never a pat on the back without the challenge to strive for a still higher goal. He never compromised with expediency when there was a job to be done for an industry or profession. In a very real sense he was one of the builders behind the builders of this chemical century.

SDK

F. Traendly, former vice-president and director of Reinhold Publishing Co.

Theodore Olive, experienced chemical and mechanical engineer, joined the editorial staff September 6, 1927. He had been a member of the mechanical experimental engineering group at Du Pont Rayon Co. in Buffalo. A year later James A. Lee, of the Bell Telephone Laboratories, a native of Louisiana and a graduate of Washington & Lee and M.I.T., was also appointed assistant editor. In the past 25 years both men have contributed significantly to the character and content of the publication. Editor Olive's first and continuing concern has been with process equipment and the Plant Notebook, but he has also carried the major responsibility for the annual unit-operations issues.

James A. Lee, managing editor from 1932 to 1950, was largely responsible for *Chem & Met's* important biennial issues on Materials of Construction. His great enthusiasm and energetic support for the southern migration of the chemical industries has led to his present position as Southwestern editor and director of the McGraw-Hill News Bureau in Houston, Texas.

As will be noted later, many others have helped to shape the editorial progress of the magazine during the past two decades. In September, 1937, was published the first "Facts and Figures of the American Chemical Industry" in an effort to stimulate an industry program in public relations. The *Chem. & Met.* Pictured Flowsheets, begun in January, 1939, and continued in each succeeding issue, have provided useful and visual evidence of the broadening applications of chemical engineering in industry. The monthly *Chem. & Met.* Reports form chapters of the most up-to-date textbook of our technology.

Reference has been made elsewhere to the Awards for Chemical Engineering Achievement which since 1933 have been sponsored by the editors and publishers of this magazine on behalf of the chemical engineering profession (see pages 147 to 153). The group efforts of engineers and management responsible for these achievements revealed the important role of the chemical engineer as the "builder behind the builders" of this chemical century.

The dominant interest that had guided the publication for almost a half century in its efforts to build the literature and profession of chemical engineering called for still another change in name. In July, 1946, the word *"Metallurgical,"* which over the years had become progressively smaller in the masthead, faded from the title of the magazine. *"Chem. & Met."* thus became *Chemical Engineering.* But its nickname lingers on, especially with us "oldtimers."

Callaham Becomes the Fourth

In May, 1950, John R. Callaham succeeded to the editorship, thus becoming the fourth to hold the title and to carry forward the traditions for militant, independent journalism so firmly established by Drs. Roeber and Parmelee. A member of the editorial staff since February, 1941, following six years of industrial experience, Mr. Callaham was well fitted for his new responsibility. As Pacific Coast editor from 1946 to 1949, he had proved an able, vigorous champion of chemical engineering and the Pacific process industries. Returning from California as executive editor, he immediately assumed new and heavier responsibilities. With the support of an enlarged and efficient staff, many improvements have been made in *Chemical Engineering.* All have been directed toward increasing its usefulness both in editorial content and presentation.

Lester B. Pope, who joined the staff as assistant editor in 1939, has been managing editor since August, 1950. Cecil H. Chilton, formerly chemical engineer in Du Pont's pigments department, was appointed associate editor in December, 1950. Morgan M. Hoover, who had been with American Cyanamid and previously with the atomic bomb project at Hanford, Washington, became assistant editor in August, 1949. Three others serve as assistant editors in New York — Joseph A. O'Connor, Richard V. Reeves, and Calvin S. Cronan. Regional editors in addition to James A. Lee, in the Southwest, include Elliot Schrier in San Francisco and Frank C. Byrnes in Chicago. Frances Arne and A. J. O'Brien, Jr., are editorial assistants and Margaret Redfield has served as art editor since November, 1949.

Over the years, *Chem & Met* has developed a small but distinguished editorial alumni association. Prominent among its members are Paul D. V. Manning of International Minerals & Chemical Corp., Andrew E.

Buchanan, Jr., Chaplin Tyler and E. C. Fetter, of the Du Pont Company, Charles Wadsworth III of Merck, Harold J. Payne of *Architectural Record*, Robert L. Taylor of Hill & Knowlton, Melvin E. Clark of Wyandotte Chemicals, Richard F. Warren of American Cyanamid, Norman Farquahar of Air Reduction, J. V. Hightower of Ralph M. Parsons Company, Richard W. Porter of *Fibre Containers*, Roger Williams, Jr., of Roger Williams, Inc., and R. L. Demmerle of General Aniline and Film.

Because this has been primarily a history of *Chemical Engineering* and its predecessors, we may have failed, unintentionally, to give adequate attention and well deserved praise to our contemporaries. *Industrial and Engineering Chemistry*, founded in 1908 by the American Chemical Society, has numbered among its editors such prominent leaders of the chemical profession as W. D. Richardson, Milton C. Whitaker, Charles H. Herty, Harrison E. Howe, and Walter J. Murphy. Its news edition, established in 1923—now *Chemical & Engineering News*—is the official organ of the society. In 1946, the American Institute of Chemical Engineers abandoned the annual volumes of its Transactions and began the monthly publication of *Chemical Engineering Progress* with F. J. Van Antwerpen its editor. Two other chemical societies also have journals. *The Chemist* is published by the American Institute of Chemists, founded in 1923. The Electrochemical Society, Inc., began publication of its journal in 1949.

As byproducts of their work, the editors of *Chemical Engineering* and its predecessors have always been encouraged to engage in activities related to the field of the magazine. Reference has already been made to the founding in 1902 of the American Electrochemical Society. In fifty years, four *Chem. & Met.* editors have served as its presidents—Roeber, 1913, Parmelee, 1923, Kirkpatrick, 1946, and Lee, 1949.

Another activity in which the magazine has been interested since its inception is the development of chemical engineering education—in particular the work of the American Institute of Chemical Engineers. Dr. Parmelee succeeded Dr. Arthur D. Little as chairman of the Institute's committee in June, 1922. It took over three years of diligent and sometimes diplomatic endeavor to put into effect the accrediting program. But the effort was exceedingly worthwhile for it set the pattern later to be followed by the accrediting committee of the Engineers' Council for Professional Development for the entire engineering profession.

Because of his efficient conduct and organization of the program, Dr. Parmelee was elected secretary of the American Institute of Chemical Engineers in 1927 and served until 1930. He was succeeded on the Council by Mr. Kirkpatrick who, following a succession of offices and committee assignments, was elected president of the Institute in 1942.

Among the several societies and group activities that can trace their origin to *Chem. & Met.'s* editorial impetus and support are: The Chemical Market Research Association and the Western Market Research Association, Commercial Chemical Development Association, Junior Chemical Engineers of New York (and elsewhere), the Process Industries Committee and later Division of the American Society of Mechanical Engineers, the Chemical Equipment Sales Engineers Association, and the Public Relations Group of the American Chemical Industry. In these and many other established associations and societies the editors have given freely of their time and effort as their voluntary contribution to the development of the industry and profession.

Building for Permanence

Magazines are, in a sense, the construction reports in the process of building the more permanent literature of the profession. They report the plans and detail the specifications. They record current progress. But periodically it is necessary for someone to establish the basic principles, to review, correlate and interpret the results of their practical application.

In its slow evolution to professional status, chemical engineering had been handicapped by the lack of an adequate book literature. The first step toward remedying this situation was taken in 1923 with the appearance of "Principles of Chemical Engineering." Collaborating as its authors were three senior professors at

Malcolm Muir
Publisher, 1910-28

Maurice A. Williamson
Publisher, 1928-49

Wallace F. Traendly
Publisher, 1949

Behind this 50th anniversary issue was lots of editorial planning and building. John Callaham has an idea on pictures that gets thoughtful consideration from Les Pope, Sid Kirkpatrick, and Margaret Redfield.

Morgan Hoover puts his finger on a tough technical problem as Ted Olive and Cecil Chilton think it over. Frances Arne is in between in this particular argument.

Where and how copy production gets underway. Joe O'Connor at the typewriter has close cooperation from Calvin Cronan. Thoughtful contributions from the sidelines come from Dick Reeves and Al O'Brien.

Jim Lee now tags his copy as Southwestern Editor and Manager of McGraw-Hill's Houston Bureau.

Frank Byrnes holds forth in Chicago as Middle Western Editor.

Elliot Schrier, Pacific Coast Editor, covers the West with headquarters in San Francisco.

M.I.T.: William H. Walker, Warren K. Lewis, and William H. McAdams. Theirs was the first textbook of the unit operations to deal quantitatively with the design of chemical engineering equipment. It was adopted almost immediately by many leading universities and within a few years became the basis for a veritable revolution in chemical engineering education.

But Dr. Parmelee and his editorial colleagues on *Chem. & Met.* quickly recognized the need for a correlated series of text and reference books to serve the rapidly growing profession. They organized a committee of prominent chemical engineers equally divided between the teaching and practice of the profession. From industry were L. H. Backeland, John V. N. Dorr, Arthur D. Little, R. S. McBride, Charles L. Reese, E. R. Weidlein and M. C. Whitaker. From universities were Harry A. Curtis of Yale, D. D. Jackson of Columbia, J. H. James of Carnegie Tech, James F. Norris, W. K. Lewis, and W. H. Walker of M.I.T., and Alfred H. White of Michigan. H. C. Parmelee served as chairman and subsequently was joined by S. D. Kirkpatrick as consulting editor for the Chemical Engineering Series.

After several meetings the committee submitted a report to the McGraw-Hill Book Co. in September 1925 in which were outlined in some detail the specifications for a dozen textbooks. As a matter of record, it is interesting to compare the committee's original suggestions with the texts that were developed and the dates of their publication:

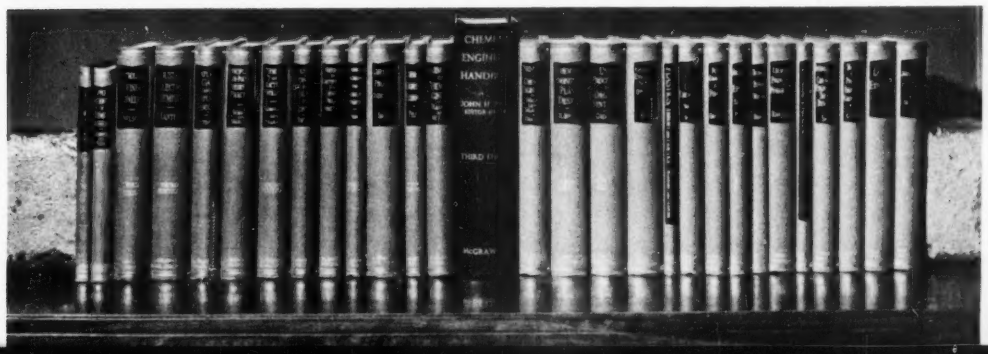
1. Elements of Chemical Engineering. First Edition under this title by W. L. Badger and W. L. McCabe published in January 1931. Second edition in 1936.
2. Principles of Chemical Engineering. First edition by Walker, Lewis and McAdams in 1923, second in 1927, third in 1937. Prof. Edwin R. Gilliland joined the surviving authors in the preparation of this third edition.
3. Chemical Engineering Handbook. First edition of "Chemical Engineers' Handbook" edited by John H. Perry was published in 1934, the second in 1941, and the third in 1950.
4. Chemical Engineering in Industry. Published as "The Chemical Process Industries" by R. N. Shreve in 1945.
5. Industrial Applications of Chemical Reactions. First edition as "Unit Processes in Organic Synthesis" edited by P. H. Groggins was published in November 1934. Second edition 1938, third edition 1947, fourth edition 1952.
6. Chemical Engineering Laboratory Manual. Project abandoned.
7. Materials of Construction for Chemical Engineering Equipment. Published as "Materials of Construction for Chemical Process Industries" by James A. Lee in November 1950.
8. Chemical Plant Design. First edition published as "Chemical Engineering Plant Design" by F. C. Vilbrandt in 1934, second edition in 1942, and third edition in 1949.
9. Mechanical Control of Chemical Engineering Operations. Published under title "Industrial Instruments for Measurement and Control" by T. J. Rhodes in 1941.
10. Chemical Engineering Economics. First edition under this title by Chaplin Tyler was published n 1926, second edition in 1938, third edition in 1948.
11. Marketing of Chemicals. Project abandoned.
12. Unit Operation Monographs. To date, five titles as follows: "Adsorption," (2 editions) by Mantell, "Elements of Fractional Distillation," (4 editions) by Robinson and Gilliland, "Absorption and Extraction," by Sherwood and Pigford, "Heat Transmission," (2 editions) by McAdams, "Liquid Extraction" by Treybal.
13. Industrial Monographs. To date, there have been seven titles as follows: "The Aluminum Industry" (in 2 vols.) by Edwards, Fraty and Jeffries, "Industrial Electrochemistry," (3 editions) by Mantell, "Petroleum Refinery Engineering," (3 editions) by Nelson, "Natural Gas and Natural Gasoline," by Huntington, "Coal, Coke and Coal Chemicals," by Wilson and Wells, "Plastics Theory and Practice," by Winding and Hasche, and "Principles of High Polymers in Theory and Practice," by Schmidt and Marlies.
14. Other basic texts. Of equal importance, but not so readily classifiable: "Chemical Engineering Thermodynamics," by Dodge, "Introduction to Chemical Engineering Thermodynamics," by Smith, "Industrial Stoichiometry," by Lewis and Radasch, "Applied Mathematics in Chemical Engineering," by Sherwood and Reed, "Inorganic Chemical Technology," by Badger and Baker, "Fuels, Combustion and Furnaces," by Griswold, "Chemical Engineering Fundamentals," by Kirkbride, "Chemical Engineering for Production Supervision," by Pierce, "Technical Report Writing," by F. H. Rhodes, and "Manual for Process Calculations," by Clarke.

In all, thirty books have been published in this series during the past quarter of a century. More are in preparation. In the aggregate, they represent a vast amount of effort on the part of many participants. Perry's "Chemical Engineers' Handbook" alone, for example, took almost seven years to produce, with the third edition representing the work of 142 contributors and an advisory committee of fifteen.

Some measure of its success may be gained by the fact that approximately 150,000 copies have been sold since 1934. But the better measure is its influence on the growth and development of the chemical engineering profession.*

Again, as was noted in our discussion of the magazines of the profession, no effort has been made here to appraise the significant contributions other authors and publishers have made to the theory and practice of chemical engineering. Some have been exceedingly important and should be included in any comprehensive review of the book literature of the profession. Yet, it is significant and perhaps stimulating to others to note how much has been accomplished through the cooperation of the relativey small group that set out 25 years ago to build a permanent literature for the chemical engineering profession. SDK

*A companion volume tentatively called "The Chemical Business Handbook" is now in preparation with Dr. Perry as co-author and editor.



Roll of Honor

	YEAR OF FIRST SUBSCRIPTION
ALABAMA	
H. A. Caldwell, Tennessee Coal, Iron & R.R. Co., Birmingham	1919
ARKANSAS	
Wm. Martin, Jacques Mfg. Co., North Little Rock	1916
CALIFORNIA	
Fred W. Twining, The Twining Laboratories, Fresno	1909
COLORADO	
Henry W. Dahlberg, The Great Western Sugar Co., Denver	1907
CONNECTICUT	
J. V. N. Dorr, The Dorr Co., Stamford	1902
DELAWARE	
George M. Norman, Hercules Powder Co. (retired), Wilmington	1902
DISTRICT OF COLUMBIA	
A. M. Houghton, Gulf Oil Corp., Washington	1911
FLORIDA	
Minerals Separation No. America Co., Lakeland	1912
GEORGIA	
J. S. Brogdon, Consultant, Atlanta	1916
IDAHO	
Bunker Hill and Sullivan Mining & Concentrating Co., Kellogg	1913
ILLINOIS	
E. F. Buchanan, Consultant, Chicago	1910
INDIANA	
W. A. Schnedeker, Du Pont Co., East Chicago	1924
IOWA	
Edward Bartow, Professor-Emeritus, Iowa City	1922

To these men who over the years have been our loyal readers and supporters we pay our respect and appreciation. Together we have traveled an interesting road these fifty years past. *We hope the fifty years* ahead *will be equally rewarding for those who carry on the work of our profession.*

EDITORS AND PUBLISHERS

KANSAS
G. E. Prewitt, Ozark Smelting & Mining Co., Coffeyville 1924

KENTUCKY
J. D. Todd, Kentucky Color & Chemical Co., Louisville 1920

LOUISIANA
C. C. Boardman, Thermatomic Carbon Co., Sterlington 1924

MARYLAND
Lawrence Addicks, Consultant, Bel Air..... 1902

MASSACHUSETTS
Hervey J. Skinner, American Conditioning House, Inc., Boston..... 1902

MICHIGAN
W. R. Veazey, Dow Chemical Co., Midland..... 1907

MISSISSIPPI
Ralph Talbot Goodwin, Pophill Plantation, Poplarville 1922

MISSOURI
Garrett B. James, Sr., Webster Groves..... 1907

MONTANA
F. F. Frick, Anaconda Mining Co., Anaconda..... 1929

NEW JERSEY
Howard B. Bishop, Human Engrg. Foundation, Summit 1909

NEW YORK
Courtland F. Carrier, Consultant, White Plains..... 1902

OHIO
George Oenschlager (retired), Akron..... 1906

OKLAHOMA
Otto M. Smith, Professor-Emeritus, Stillwater..... 1923

OREGON
George W. Gleeson, Dean of Engineering, Corvallis.. 1928

PENNSYLVANIA
Francis C. Frary, Aluminum Co. of America (retired), New Kensington..... 1904

SOUTH CAROLINA
A. M. Taylor, retired, Spartanburg..... 1902

TENNESSEE
Harry A. Curtis, Tenn. Valley Authority, Knoxville.. 1910

TEXAS
A. M. McAfee, Gulf Oil Corp., Port Arthur..... 1902

UTAH
A. C. Boyle, Consulting Engineer, Salt Lake City..... 1916

VIRGINIA
Robert B. Arnold, Tobacco By-Products and Chemical Co., Richmond..... 1904

WASHINGTON
H. K. Benson, Consultant, North Seattle..... 1912

WEST VIRGINIA
Bernard H. Jacobson, Ohio-Apex, Inc., Nitro..... 1926

WISCONSIN
Otto L. Kowalke, Professor-Emeritus, Madison..... 1906

CANADA
Ernest A. LeSueur (retired), Ottawa..... 1902

ENGLAND
C. J. Goodwin, consultant, London, E.C. 3..... 1919

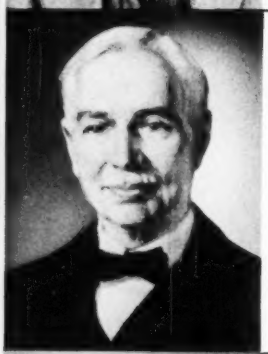
INDIA
J. N. Bewsher, Mssrs Tata Chemicals Ltd., Saurasthra 1909

MILTON C. WHITAKER, 1870-

Before coming to New York in 1917 I had the advantage of knowing M. C.'s brother, O. R. Whitaker, a successful mining engineer in Denver. So I was prepared to meet a man of large physique and strong personality, yet of quiet demeanor and friendly approach. As an editor I became indebted to M. C. for many dramatic and picturesque expressions, mostly printable. He often referred to research chemists and plant engineers as race horses and draft animals, respectively; and the folly of hitching a race horse to a plow. I recall his thesis that the function of engineering is to take the element of surprise out of business—a talent he himself uses with exceptional skill. HCP

JOHN V. N. DORR, 1872-

We first met in Deadwood, S. D. in 1905. Perhaps it was our Vandyke beards that drew us together to form a bond of friendship that has survived almost a half century. Dorr had been operating a cyanide mill that was facing financial disaster. But two innate qualities not only helped to avert bankruptcy but started him on a world-wide career of fame and fortune. His persuasive charm was such that he actually succeeded in borrowing money from a labor union! His inventive genius brought forth the first of a succession of efficient processes and equipment that were soon to become the universal tools of chemical and metallurgical engineering. Greatly to his credit, too, was his pioneering at Westport, Conn. of "research in the country," an example widely copied ever since. HCP



ALFRED H. WHITE, 1873-

We served together in 1922 on the A.I.Ch.E. accrediting committee on chemical engineering education—a pioneer committee if ever there was one. White was there because he was a qualified and competent educator who had early established chemical engineering on a sound basis at Michigan. I, as chairman, recall the skill with which he laid the ground work for our deliberations, the breadth of his concept of engineering education, and the wise counsel with which he modestly guided the committee through its formative years. To Alfred H. White the profession owes a debt for his help in blazing the new trail that led to the accrediting of chemical engineering curricula, subsequently followed by E.C.P.D. for the entire engineering profession. HCP

HOWARD C. PARMELEE, 1874-

We met for lunch in Washington's old Occidental Hotel one Spring day in 1921. I was nervous and excited for he was looking me over as a prospective editor. But I too was also doing some looking. My interviewer seemed a bundle of nervous energy, with really infectious enthusiasm for the field of technical journalism. It didn't take me very long to reach a decision I've never had cause to regret. To follow in his footsteps through a succession of editorial jobs and professional responsibilities has proved a thrilling, satisfying experience. To emulate his friendliness, courage and intellectual integrity, his even-tempered judgment and encouragement of his fellow men is still the goal of my ambitions. The moral of my little story—pick the right boss and stay with him. SDK

WARREN K. LEWIS, 1882-

Colonel Walker often said that his greatest discovery was a farmer's boy from Delaware whom he finally persuaded to teach chemical engineering at Tech. Had he failed our profession might have failed with him. Instead there are thousands of chemical engineers, many in top positions in industry, who are forever in debt for the inspiration and training they received from W. K. Lewis. On August 21 he will celebrate his 70th birthday and is now threatening in earnest to move back to the family farm in Delaware. Should we let him? SDK

FRANCIS C. FRARY, 1884-

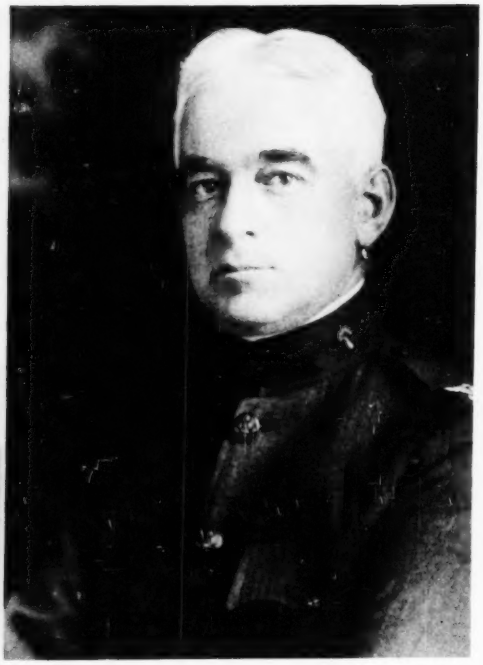
I remember the Frarys at my first Electrochemical Society meeting in Denver in 1913. Recalling the modest pay of young professors, I considered that Frary's attendance, with his wife, showed more than average determination to be a part of his profession and industry, to know and be known, and get the benefit of mixing with his fellows. For this he has unusual aptitude and personality. Combining these with great energy and ability, he has risen to high positions. But I am sure he would appraise the Aluminum Research Laboratories and their accomplishments as the outstanding achievement of his career. HCP

WALTER L. BADGER, 1886-

When Parmelee's committee outlined the need for a book on the elements of chemical engineering, quite naturally we turned to Michigan for it. We knew that for 20 years Prof. Badger had been giving his students a thorough grounding in the actual design, construction and operation of process equipment. Teamed with his younger colleague, Warren McCabe, they produced a unique and valuable tool for the profession. Since then both have become busy men in industry, Badger as a consultant of international reputation, McCabe as a leading research director and executive. But there is still need for the product of their teamwork. SDK

JOHN H. PERRY, 1895-

Like the little Red Queen you have to run awfully fast to keep from standing still when you're working with Jack Perry. He does a prodigious amount of thinking, planning and writing for the ultimate good of our profession. His monumental "Chemical Engineers' Handbook" has probably done more than any other book to advance the art and practice of chemical engineering throughout the world. Now he's equally engrossed with a companion volume to ease the entry of technical men into the business management of chemical and related enterprises. Hundreds of us who have worked for and with Jack Perry know him as an able engineer, a competent leader, a loyal and understanding friend, always willing "to give some of his time and thought and energy to the profession of which he is a part." SDK



During World War I, William H. Walker commanded Edgewood Arsenal with rank of colonel in the Chemical Warfare Service.

Reminiscences of the "Father of Chemical Engineering"
(Continued from page 159)

the Research Laboratory of Applied Science. I knew that Dr. Noyes was extremely patient but always meticulous about that fourth decimal place. Dr. Walker, on the other hand, was pressing everlastingly to get a problem solved, even though the data might be somewhat sketchy. And I knew that he would be likely to give you a kick in the pants about once a month just for the good of your soul. My own conclusion was that I would get a lot more done under Dr. Walker, and I think the judgment was sound.

"I scarcely need to mention, especially to you, Dr. Walker's very real enthusiasm for chemical engineering and its possibilities – nor his ability to transmit that enthusiasm to those of us who worked with him."

Walker-Lewis, Superb but Fractious Team

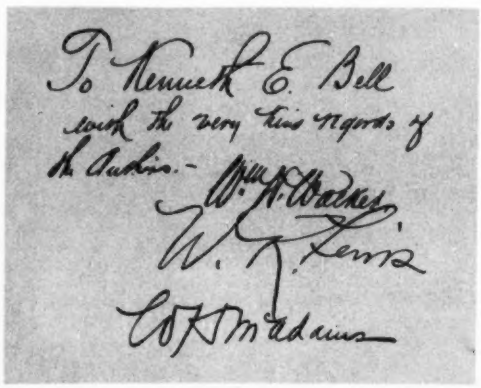
Kenneth E. Bell, vice president of A. C. Lawrence Leather Co., served as Colonel Walker's aide when he commanded Edgewood Arsenal in 1918-9 and later assisted Walker, Lewis and McAdams in the summer they first worked on "the book." Here are some slightly edited excerpts from a personal communication:

"William H. Walker was one of the giants of our times. He and Warren K. Lewis made a superb team. Dr. Walker was a marvellous 'front man.' Lewis, the Delaware farmboy, had the technical brains which under Walker's aegis he learned to use with such telling effect. Both had inexhaustible stores of energy and if times were dull, they used them to create havoc in a faculty meeting just for the fun of seeing the fur fly.

"Dr. Walker developed an enviable reputation as a patent suit expert. He worked exhibits, models and diagrams into a most lucid explanation to make abstruse technical points clear to judges devoid of scientific knowledge. Indeed, his reputation on the stand was such that cases were often compromised out of court once the opposition heard he had been retained. Yet Walker was a crusader for truth and always most vehement against engineers who prostituted their profession in distorting facts to secure a favorable decision.

"I spent a mighty hilarious month at Bridgeton, Me., working with the authors of 'PCE.' On arrival I was met by 'Doc' Lewis driving the same Model T Ford which only a month before I had instructed him to operate. His opening barrage was 'Hello, Bell! Walker is a grand guy, but he thinks mathematical equations will ruin the book. I am having a helluva time with him.' Dr. Walker got me over to the quiet of his cottage and said, 'Lewis, you know, can talk rationally and brilliantly. But set him in front of a stenographer and he dictates the most inane drivel you ever read. Just look at this sentence . . .' It occupied three-quarters of a page! Lewis' nimble mind went faster than his tongue. Qualifying phrase after qualifying phrase occurred to him and were poured into the single sentence.

"The procedure was that Lewis smoothed the chapter to what he considered perfection. It was then submitted to Dr. Walker who made such revisions as he deemed essential. Then came the arguments. Voices rose with tempers until finally Walker would blurt out, 'Oh, my God, Warren, can't I make you see sense?' Then he would stalk off in a towering rage. In the afternoon (when we were not supposed to work) Lewis would stroll calmly over to Walker's cottage. Later he would return either with his chest thrown out and whistling loudly and decidedly out of key, or slink in like a wet cat depending on the outcome of the argument. You can see why it took until 1923 to complete 'the book.' But it finally was and I'm mighty proud of my copy of the first edition with its inscription in the handwriting of William H. Walker." (See below.)



CHEMICAL PROCESS INDUSTRIES MUST FACE THESE

Problems of the Future

PROBLEMS which chemical engineers and management men have faced and solved in the fifty years *past* differ significantly from those of the present and the foreseeable future. In the first quarter of this century the chemical process industries struggled for their very existence. Production—at almost any cost—was the goal. Then came the challenge of competition, the need for more efficient processes and more economical distribution. Now we are in a period of accelerated growth—seemingly with great opportunities opening before us. Yet many of our technical problems are complicated with broad social and economic issues—some of which are beyond chemical engineering abilities or jurisdiction.

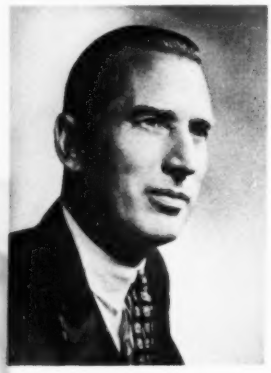
Yet it is axiomatic that the continued progress of the chemical process industries will depend on how well we solve the problems of the fifty years *ahead*. To help direct your efforts in that direction we have asked more than a hundred authorities in 25 different industries: *"What are the outstanding problems of your field whose solution would have most influence on its future progress?"*

From the replies of these specialists we have selected and reported their well-considered opinions on the problems of the future. The pages that follow are a veritable symposium on the future of chemical engineering in industry. They bristle with challenging ideas for those who carry forward the work of "Building this Chemical Century."

The Editors

Ten Fundamental Problems That All Chemical

CRAWFORD H. GREENEWALT, *President*, E. I. du Pont de Nemours & Co., Inc.



J. G. DAVIDSON, *President*, Carbide and Carbon Chemicals Co.

JOHN E. McKEEN, *President*, Chas. Pfizer & Co., Inc.

1. THREATS TO FREEDOM

Stated simply, our greatest problem is one with which civilization has struggled since its earliest beginnings—human freedom. In the long perspective of history this goal became a reality only when our nation was born and dedicated to the principle of individual liberty.

The industrial society we have built on this firm foundation is one that has astonished the world. We have created an environment which calls forth the best effort of all our people. We have been free to pursue our own destinies and retain the fruits of our efforts. As a result, we have had a growth and development far beyond the wildest expectations.

Now, at home as well as abroad, that principle of human liberty is threatened. Restraints and restrictions upon freedom of the individual are already slowing down our rate of progress. More specifically, they are setting precedents which could well undermine the whole structure of our strength as a nation. If our experiment in liberty is to be any more than a brief interlude, we must be quick to defend it against all aggressors.

2. FINANCING FUTURE GROWTH

Chemical industry has been expanding so fast and the Government has been taking such a large proportion of its profits in taxes that it is now almost impossible for the industry to finance itself out of earnings. Nor can we even approximately maintain the growth necessitated by the increasing knowledge we have gained through research, by the number of new products we should develop and by the expanding need for those we now manufacture.

Look back at the great growth of the aliphatic chemical industry during the last 25 years. Until recently it was largely financed out of earnings. Today that is almost impossible. Yet we are on the threshold of a development in the field of aromatic chemistry via coal hydrogenation that bids fair to have even greater growth. If it succeeds to only half the extent of the aliphatic chemical industry, the amount of money required will be very large indeed.

I foresee no serious difficulty in raising the capital needed for the future growth of the chemical industry. But whether it is done by bank loans or by the sale of preferred or common stock poses a most important problem. It will have to be studied carefully with particular reference to conditions surrounding each individual company.

3. BETTER TEAMWORK

Looking ahead in the chemical industry I feel that we may confidently expect important developments to match, indeed to exceed, the significant strides that have been made in the past. But to do this we shall have to overcome serious problems of organization and manpower.

Although we have all made progress in organizing our research to keep it abreast or ahead of scientific development, the problem becomes more acute each day. Its solution requires that we use every variety of technical talent available. The key to the future is continued building of research teams in which scientists and engineers work together toward unified objectives.

Once we have wisely organized our research, we must accomplish the same coordination with production teams to make more goods of better quality at lower costs to the ultimate consumer. Coordinated, stepped-up production can accomplish a great deal for any company.

The third phase of our problem is a natural consequence of and dependent on the first two. We must learn to sell more efficiently and we must improve our methods of distribution so that the benefits of all our products may reach all who need them. Ours is an industry where imagination and ingenuity are necessary in sales as well as in research and production. Ours is an industry based on teamwork of highly-trained scientists and engineers working together for the welfare of their fellow men.

Industries Must Face in the Fifty Years Ahead

4. IMPROVED UNDERSTANDING

The answers to the problems which man will face during the next fifty years, I believe, will not be found in science and technology alone. But science will continue, at a slower pace than in the past, to contribute to our ability to shape the world closer to our desires, particularly through an improved understanding of our bodies and minds. Research in biochemistry, steroid chemistry and neurophysiology will result in healthier, longer lives by providing knowledge to check degenerative diseases, cancer, heart disease and virus-caused diseases such as the common cold and infantile paralysis.

To help provide for an increased population, atomic energy will supply electrical power, the soil will be made more fertile, and marginal lands throughout the world will be reclaimed for agricultural use. And the crops will be better protected and the food better preserved to nourish additional lives. I also believe that men will slowly achieve the maturity and wisdom —as we must in the compressed world of the future—so we can live together tolerantly, understandingly, cooperatively and in peace, if we choose to.

CHARLES ALLEN THOMAS, *President*
Monsanto Chemical Co.

5. RISING COSTS

How can chemical industry meet the problem of ever-increasing costs of production? Many of these increases merely reflect the trend of the times. But the most troublesome problems arise when our needs have outgrown the original availability of byproduct raw materials, thereby necessitating the use of higher priced substitutes.

An increasing number of chemical products are losing out to competitive materials in low-priced markets. Shifts of this sort require constant re-evaluation of uses and the development of new markets capable of sustaining the steadily increasing costs. This heightened competition has placed a premium on competent personnel, particularly those qualified for exploratory sales research and the technical development of new markets.

A secondary problem is more political than scientific or economic. It springs from the increasing interest of governmental regulatory agencies in many chemical products and uses. Examples in point are the activities of the Food and Drug Administration and the licensing of agricultural chemicals by the Department of Agriculture. While presumed to be in the public interest, these activities add a tremendous burden on the industry, thereby increasing further the costs of continued growth in the use of many important chemical products.

MARK E. PUTNAM, *Executive Vice Pres.*
The Dow Chemical Co.

6. MANPOWER FOR RESEARCH

We have reached the stage of development in chemical industry where a good chemist with a creative mind can dream up important research projects far beyond the capacity of available manpower to reduce them to practice. There is an even greater shortage of men and women skilled in applications work. So far as I am aware, no university has yet met the challenge of Dr. George Curme's Gibbs medal address and designed a curriculum to train people for this field. Meanwhile we often have to take scientists away from other important projects and hope that they can develop themselves in the art of finding uses for new and old products.

The day when a catalyst can be developed for almost any given reaction whose mechanism is understood seems to be foreshadowed by recent discoveries. If we are thus enabled to imitate the action of enzymes, a new dimension will be added to organic synthesis. This should lead, as a distant goal, to the reproducible synthesis of simple living organisms.

The era of infectious diseases seems to be drawing to a close, thanks to antibiotics and synthetic organic chemicals. The control of the diseases of economically important animals and plants is still relatively undeveloped. This, too, will come.

HENRY B. HASS, *President*,
Sugar Research Foundation, Inc.

J. WARREN KINSMAN, *Vice President*
E. I. du Pont de Nemours & Co., Inc.

GASTON DUBOIS,
Formerly Exec. Vice President
Monsanto Chemical Co.

JOHN J. GREBE, *Research Counselor*,
The Dow Chemical Co.

HARVEY M. MERKER, *Director of Inventory Control and Chemical consultant*, Parke, Davis & Co.

7. HIGHER CALIBER SALESMANSHIP

We have constructed a national productive capacity beyond our internal needs and those of foreign markets. How then to keep active and profitable our American enterprise system, for all who depend upon its fruits, must give growing concern to chemical management.

It has become stylish to say we have forgotten how to sell. More correctly, we can say that conditions have denied us the privilege of practicing the high caliber salesmanship of which we are capable.

Selling is today confronted with a greater task than ever faced manufacturing for it is easier to build plants than it is to expand and create markets. Only selling can rescue us from the unwanted social consequences of some future depression.

Today some alert sales staffs are preparing for the challenge with more effective sales and advertising methods. But it is not enough to have only a few units of business being readied for the job of moving into consuming channels the prodigious quantities of goods our industries are geared to make. All must do their part. All must realize that selling is henceforth the powerhouse in a dynamic economy. All must remember, too, that no one profits until goods are sold.

8. FUELS FOR THE FUTURE

The outstanding problem which must eventually be solved by chemical engineers is the improvement of present processes for producing liquid fuels. As our supply of natural petroleum products is gradually depleted, we shall turn to lignite, bituminous coal and oil shale. This change will have a most astounding influence on the future development of our organic chemical industry.

Many basic aromatic chemicals, now in short supply, will be obtained as byproducts of synthetic fuels. Likewise important aliphatics will take over an increasing proportion of available petroleum. And we shall be able to transport through pipelines new liquid or gaseous fuels at far lower costs per unit of heat value.

9. HIGHER QUALITY AT LOWER COST

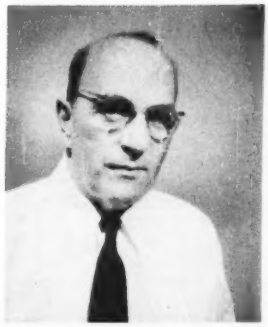
The organic chemical industry of the future will center around such basic raw materials as petroleum, coal, natural gas, carbohydrates and various fats and oils and proteins. The really big opportunity facing us is to reduce costs and improve the quality of the important intermediates. This means that ethylene, propylene, benzene, toluene, carbon disulphide, acetylene, hydrogen cyanide, aldehydes, acids, and ketones will have to be made much cheaper and in ever increasing quantities. This will come from new concepts rather than by rehashing 15-year old techniques recently imported from abroad. Success in such fundamental improvements will determine our leaders in the years ahead.

10. COOPERATION IN EDUCATION

The future success of our industries will be measured by a continuing and adequately supply of personnel, particularly of chemists and chemical engineers with diversified training. Industry must cooperate, both at university and adult education levels, in order to produce the essential people we need. And considering present labor conditions and trends, the need is not confined to scientists and technical personnel.

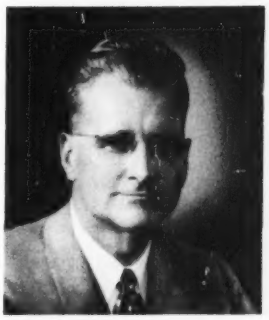
Basic problems for chemical engineers include (1) more plentiful and economical supplies of water and power, (2) safer waste disposal and utilization processes, and (3) better and sounder construction to eliminate corrosion and other manufacturing losses.

Basic Research Will Pace Pharmaceuticals' Growth



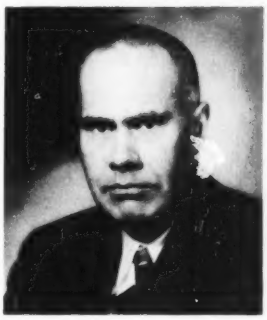
ALBERT J. FREY
Vice President, Hoffmann-La Roche, Inc.

Our industry will advance as science in general advances, and the fate of our companies hinges on their own research. The problem, then, is to harness the knowledge from scientific advances to create new compounds to combat cancer, polio, tuberculosis and man's other diseases and to prolong life. Sound chemical engineering is vital too, for it turns these research findings into commercial products that people can afford to buy and use. Finally, promotion and sales must help the rapid and proper use of these new products—and provide the returns for more research. Research, engineering, sales: These are the tools from which we will carve our future.



ERNEST H. VOLWILER
President and General Manager, Abbott Laboratories

We have impressed the public and the public will be glad to finance our future growth. But we must nourish this by showing that we can develop new and better drugs. In some areas, we must start almost from scratch. Our attack on viruses, for example, is only a beginning. Tuberculosis must—and will—be controlled. We must give more study to man's nervous system and to its disorders. And we must pay particular attention to those people past middle age and convert our fundamental work on hypertension and kidney disease, cancer, rheumatoid and arthritic conditions into effective controls. But the real key to our future hinges on keeping virility and momentum in our field. For this, in turn, will stimulate the world's brilliant researchers to continue their lively interest in the basic problems of biologic science.



RANDOLPH T. MAJOR
Vice President and Scientific Director, Merck & Co., Inc.

Basic research today and tomorrow: that's the solution to the problems which will influence the progress of the pharmaceutical industry. We need to know more about living cells, their nature and how they grow, reproduce, function as organisms, how drugs act on them. We need to know more about how living cells age and how to control and check the processes. The nature and control of virus diseases, mental disorders, cancer, heart and circulatory diseases are voids in our knowledge. And for all these problems we need—and must get—a growing body of young scientists willing to devote themselves to the problems of our industry. With the intelligent support of our people, the pharmaceutical industry will continue its rapid growth. With the intelligent support of our government, we will keep that initiative so vital to all progress.

RICHARD O. ROBLIN, JR.
Director, Chemotherapy Division, American Cyanamid Co.

The most striking progress of the next half century will be in the realm of non-infectious diseases, including those of old age. Especially challenging are cancer, hypertension and arteriosclerosis. Then, too, the entire realm of mental diseases and psychoses remains to be explored. And we can look forward to more progress in the field of endocrinology; studies of the adrenal and pituitary hormones have already led to striking and unpredictable results. But there are still many problems in the control of infections, especially those caused by the smaller viruses. We may even develop synthetic high-molecular weight substances that will give lasting immunity from a single injection. Our ultimate goal is to prevent disease.

Petrochemicals May Suffer Growing Pains

Active market development will be necessary in order to keep this young industry healthy and growing.

Although the petrochemical industry is rapidly outgrowing its knee pants, three of the five experts who have undertaken to look into its future foresee some serious problems of adolescence facing the industry. The problem, stated bluntly, is this: Has the industry expanded at too rapid a rate?

As aptly put by L. P. Scoville, "The very glamor of the industry may work to its detriment by attracting more producers than the market can support."

The government is partly responsible for this condition, thinks John Fennebresque, by conducting a vigorous campaign to encourage expansion in most of the basic petrochemical products. Firms that were already established in the petrochemical field have expanded their productive facilities, and firms that were outside the field have rapidly been acquiring petrochemical facilities. He states:

"Although a study of the history of the chemical industry indicates that our economy has been able to absorb tremendous quantities of chemicals at an ever-increasing rate, we believe that it will be some time before demand can catch up with the potential supply from existing facilities and authorized expansion."

Another warning is sounded by Leonard Hasche. He emphasizes the probable future competition of petrochemicals vs. chemicals produced as by-products of Fischer-Tropsch and coal hydrogenation plants. While this threat does not seem to be of immediate importance to Mr. Hasche, he thinks it is an important factor which should be taken into account by the petrochemical industry in future planning.

How can this problem be solved? According to Mr. Scoville, the industry must engage in farsighted market and commercial development work and forecasting.

On the brighter side, Dr. George O. Curme points out, "Applications of synthetic organic chemicals range the whole field of human wants which today are satisfied neither in quantity nor quality." He admits, however, that rapid growth introduces problems which cannot be solved by scientific experimentation.

Also among the top problems is the shortage of technical manpower. This situation is particularly critical for the petrochemical industry. As Mr. Scoville puts it:

"The industry is new and growing rapidly, and consequently must solve new problems and develop new processes at a faster rate than the average industry. For this reason, the procurement and training of high-quality technical manpower by the industry is probably one of the major problems which must be overcome in order to maintain the industry's growth."

This opinion is shared by Jan Oostermeyer, who thinks that technical manpower could be a limitation of future progress.

Another problem generally recognized is the effect of government controls. According to Mr. Oostermeyer:

"Money is probably going to be the most serious problem. If the government trend toward controlling prices continues to restrict profits, rather than normal competition, and if the high taxes demanded from successful expanding and risky business ventures are continued, obtaining the risk capital required to expand the industry could become difficult."

This problem is particularly serious, points out Mr. Scoville, for a new and rapidly growing industry.

Dr. Curme bluntly puts the question thus: "Can our society over the next 50 years maintain a sufficiently free economy for creative processes to mature?"

Along more technical lines, Mr. Hasche would like to see the development of new or improved processes. He notes the need for commercial proving on a large scale of thermal and partial combustion processes for the production of acetylene from natural gas hydrocarbons. In his opinion, calcium carbide does not supply the answer to the need for increased quantities of acetylene, because of power shortages and higher material costs. He also points out the need for new and improved catalytic processes to carry out dehydrogenation, cyclization and alkylation reactions to produce the types of olefins and aromatic hydrocarbons needed by the chemical industry.

Availability of raw materials for petrochemicals poses no real problem as yet, in the opinion of Mr. Oostermeyer. Requirements of the petrochemical industry represent a very small percentage of the total production of petroleum products. "Furthermore," he continues, "the trend toward higher octane gasolines is resulting in a more than proportionate increase in capacity of catalytic cracking and reforming units which produce the basic raw materials for petrochemicals. And, too, pipelines are being constructed which bring natural gas to chemical producing areas."

On the other hand, Mr. Hasche predicts the trend toward tailor-made hydrocarbon charging stocks for the production of ethylene and acetylene. He feels, too, that the industry must develop and improve thermal cracking processes for the use of heavier petroleum fractions as charge stocks to produce lighter olefins and aromatics.

JOHN D. FENNEBRESQUE,
Vice President,
Celanese Corp. of America

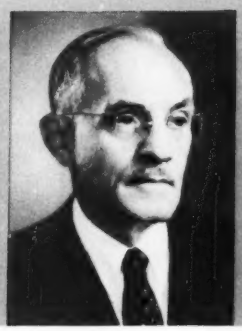
LOREN P. SCOVILLE,
Vice President,
Jefferson Chemical Co.

GEORGE O. CURME, JR.,
Vice President, Union Carbide and Carbon Corp.

R. LEONARD HASCHE,
Consultant,
Johnson City, Tenn.

JAN OOSTERMEYER,
President,
Shell Chemical Corp.

ROSS W. THOMAS, *Vice Pres.,*
Research & Development,
Phillips Petroleum Co.



GUSTAV EGLOFF,
Director of Research,
Universal Oil Products Co.

ROBERT E. WILSON,
Chairman of the Board,
Standard Oil Co. (Indiana)

Wanted: More Crude Oil, Less Governmental Control

Industry experts also see manpower shortage as serious threat to future development of improved refining processes and new products.

Although the petroleum industry may eventually face, at some time in the future, the exhaustion of sources of crude oil, the feeling voiced by a cross-section of industry executives is that this can be postponed considerably by development of more efficient methods for finding and producing crude oil. Since petroleum is by far the best and most economical raw material for conversion into hydrocarbon products, the day when the industry must turn to other primary sources, such as coal and shale, should be postponed as long as possible.

There is a definite need for new techniques in exploration. As expressed by Dr. R. E. Wilson, "It would be wonderful if means could be devised for detecting the presence of oil itself, instead of simply the presence of rock formations that are the right shape for trapping oil."

Ross W. Thomas would like to see the development of improved means of drilling holes in the ground. He reasons that high drilling costs now limit production in marginal areas and the exploitation of deep formations.

In addition to finding new sources, industry experts agree that much can be done in recovering more crude from fields already in production. "The oil industry requires cheap and efficient methods which will permit 100 percent recovery of the oil in underground formations instead of the present 20 to 80 percent," says Dr. Gustav Egloff.

According to Dr. Wilson, these methods will require increased basic knowledge of rheology, interfacial tensions, and other hydrocarbon properties, particularly in the critical regions. Mr. Thomas recommends the unitized development and operation of both new and existing fields in order to increase the amount of oil and gas that can be economically recovered.

There is some feeling that the imminent exhaustion of crude oil supplies has been over-emphasized. In the opinion of V. A. Kalichevsky, "The huge and continually growing reserves of crude oil relieve the fear of foreseeable shortages of raw materials."

Both M. E. Spaght and H. W. Field agree that the industry must shoulder the great responsibility of continuing to supply mankind with an adequate, economical source of energy in the form of liquid fuels.

In spite of expected improvements in exploration and production, Dr. Wilson and Dr. Wayne Kuhn are looking farther ahead to the day when production of hydrocarbon fuels and lubricants must come from sources other than crude oil, such as coal and shale. Voicing opposition to the proposed immediate construction of full-scale plants, Dr. Wilson states:

"For many years to come this work can best be done on a laboratory or pilot-plant scale, rather than wasting money on the construction and operation of large-scale plants which would be obsolete before they were completed."

Vying closely for top honors among the problems facing the industry is the threat to free enterprise by government control and high taxation. C. G. Kirkbride calls this "the most serious problem with which we and all other industries are faced." Agrees Dr. Wilson:

"By far the most important need of the petroleum industry is the preservation of the competitive free enterprise system and its accompanying economic incentives. Only these incentives can insure continued outstanding technological achievements of the type that have marked the industry's past history."

In the words of Dr. Kalichevsky, "Confiscatory taxation is imposed on companies and individuals in the forms of progressive income tax and amortization of equipment through fast-depreciating dollars. This leaves little inducement for advancement."

Effective solution of this problem, thinks Mr. Kirkbride, "would have the greatest influence by far on the future of the petroleum industry." Dr. Kalichevsky admits, however, that the problem can be solved only by legislative action. (Continued on pages 186-7).

Oil Refiners Seek New or Improved Processes

Leaders in petroleum refining see a need for new technology in converting crude oil into useful products.

CHALMER G. KIRKBRIDE, *President, Houdry Process Corp.*

VLADIMIR A. KALICHEVSKY, *Consulting Chemical Engineer, Magnolia Petroleum Co.*

JOSEPH K. ROBERTS, *General Manager, Research & Development, Standard Oil Co. (Indiana)*

Ross W. Thomas proposes the following eight-point program as a useful basis for discussing the problems of the future:

1. Devise means of cheaply desulphurizing crude oils, thereby reducing costs of building and operating refineries and improving the refined products.
2. Upgrade low-return residual oils and very heavy crudes by new and better processes to make them more economically transportable and more usable.
3. Develop a greatly improved and much more efficient means of upgrading natural gas to liquid products and needed chemicals.
4. Provide improved physical or chemical separation methods to produce specific hydrocarbons more cheaply.
5. Accurately predict the extent and timing of future use of turbine-type combustion engines, and the process and product changes which will result.
6. Encourage and perhaps help a larger number of qualified youths to obtain a scientific education. Shortage of scientific manpower is already a partially limiting factor in the development of needed new concepts in the petroleum and petrochemical industries.
7. Make better use of the technical and statistical information already available.
8. Promote technical understanding between designers of engines and manufacturers of fuels. Engines requiring fuels that can only be made by expending more energy than is obtained by burning are basically wasteful.

Echoing Mr. Thomas' Point Four, Joseph K. Roberts states: "A continuing need of the petroleum industry is improved ways of separating mixtures into products tailored for specific uses. Centrifugal and other efficient methods of contacting should be further developed, particularly for liquid-liquid and liquid-vapor systems. More selective solvents and solid adsorbents are also needed, along with more accurate mathematical methods of predicting the performance of all types of plants and equipment." In connection with desulphurization, Mr. Roberts suggests further development of bacterial methods, such as are now used for waste disposal.

To carry out Mr. Thomas' Point Two, Dr. Egloff suggests the hydrogenation of heavy crude oil, heavy distillates, residual oils and tars. He feels that cheaper sources of hydrogen and new or improved catalysts should be developed. In addition, Dr. Egloff foresees the need for making greater numbers of individual hydrocarbons, so that higher quality motor fuels and chemical derivatives can be manufactured. These processes will also require new or improved catalysts.

The experts point out the need for better catalysts for many other processing operations. Mr. Roberts goes out on a limb with this statement:

"Looking far into the future, it seems possible that the major oil products may some day be made by first converting the raw material to synthesis gas (hydrogen plus carbon monoxide) or to light olefins. These would then be passed over highly selective catalysts to produce gasoline, aromatics, plastics, or oxygenated chemicals, as desired."

Dr. Kuhn says that there will unquestionably be a continued demand for improved fuels imposed by the higher output of internal combustion engines. "To produce this improved fuel will necessitate continued research and development on improved catalytic cracking and probably an increased emphasis on catalytic reforming."

The industry must keep itself ready to supply the demands for new or improved products. "In addition to supplying energy," says Mr. Field, "the petroleum industry must look forward to supplying an ever-increasing share

of the chemical raw materials and products derived from hydrocarbons. Highways must be paved with superior surfaces, and automotive and industrial equipment must be lubricated safely and for long life."

Speaking of lubricants, Mr. Roberts feels that present refining techniques are adequate; the greatest need is for further development of additives used to confer specific properties.

Development of new processes and products will require more basic knowledge, especially about reaction mechanisms and catalysts. "Among the specific reactions urgently needing development," states Mr. Roberts, "are the dehydrocyclization of paraffins to form aromatics and thus upgrade virgin naphthas."

Dr. Wilson recommends that the industry expand its cooperative research and also encourage and support the basic research in the universities. Particularly needed is further knowledge about the relation of hydrocarbon properties to molecular structures; also needed are improved methods of analyzing complex hydrocarbon mixtures.

Successful solution of the problems of the future will depend upon the application of a high degree of technical skill. Supply of adequate technically trained manpower seems to Dr. Kuhn especially to be one of the industry's major problems. He states:

"Scientists and engineers are vitally needed, and no view of the future should neglect this important consideration. The critical shortage of scientists and engineers today is likely to be evident for a long period unless there is a marked change in our economy.

"It is essential that industry have an adequate staff of technical personnel. This technical personnel must be provided for research, process development, construction development, technical service to operating groups, technical service to marketing groups, and in an advisory capacity to planning groups. The Department of Labor, or almost any other source of information, indicates that we can expect a marked reduction in the availability of scientists and engineering graduates in 1953 as compared with 1952 and even a more drastic drop in availability of this type of personnel in 1954. It is further indicated that the registrations of young people in freshman classes in college science and engineering is down to an alarming low.

"This technical manpower situation certainly furnishes a prominent signpost visible to industry today which emphasizes that everything possible must be done to train our available technical personnel more efficiently and effectively. Every effort must be made to enable these men to utilize their talents at the highest level of capabilities."

That the petroleum refiners are cognizant of opportunities in the burgeoning field of petrochemicals is almost self-evident. Dr. Kuhn is of the opinion that "chemicals from petroleum will continue to increase in volume and variety." But he also points out that "although this is a field in which fascinating and startling technical developments are continually being reported and a field where technological development is clearly evident, nevertheless we must take cognizance of the fact that the raw material requirements are very small. In fact, the petrochemical industry requires considerably less than one percent of our total crude oil production today. The crude requirements for chemicals probably will not exceed two percent of the total crude available for a long time in the future."

As pointed out elsewhere, the petroleum industry like many other is faced with difficult problems that are beyond the jurisdiction of its chemical engineers and technologists. Mr. Kalichevsky has summarized this situation as follows:

"The sound foundation on which industry was built is now in danger of crumbling. Industrial progress is directly connected with the welfare of corporations and individuals. High investments and coordination of efforts required in the development and uses of petroleum resources demand the existence of large, integrated companies. Confiscatory taxation is imposed on the companies and individuals in the forms of progressive income tax and amortization of equipment through the fast-depreciating dollars. This leaves little inducement for advancement. The problem can be solved only by legislative action. It is of direct concern to every individual whose well-being is dependent on the incentives which the petroleum industry will have for providing us with the daily necessities supplied and created by crude oil."

All seem to agree with C. G. Kirkbride that "the effective solution of the problem of high tax barriers, bureaucratic regulations, and executive directives would have the greatest influence by far on the future of the petroleum industry."

MONROE E. SPAGHT, *President, Shell Development Co.*

WAYNE E. KUHN, *Manager, Technical & Research Div., Texas Co.*

HUGH W. FIELD, *General Manager, Research & Development Dept., Atlantic Refining Co.*

The Nation's Chlor-Alkali Industry Must Integrate

R. LINDLEY MURRAY
President, Hooker Electrochemical Co.

The problem we face is this: How can we put to use – and at a profit – the flood of caustic soda our industry will soon pour out? How can we find outlets for 50 percent more caustic when already, market-wise, this chemical is close to dragging its feet? The answers are obvious: stop making caustic from soda ash, open up new markets, find new chemical uses – brand new uses – for caustic. And finally, we must develop processes that will give us chlorine without caustic soda–such as from byproduct hydrochloric acid. The answers are obvious, but the solutions will have to come the hard way.

MAX Y. SEATON
Executive Vice President, Westvaco Chemical Division, Food Machinery & Chemical Corp.

Today we face powerful economic forces that are driving all chlorine producers toward integration with chlorine consumers. This may well mean that some day the chlor-alkali industry will no longer exist as an independent business. The squeeze on profits, the skyrocketing capital cost of new electrolytic plants, manufacturing know-how that's now commonplace and open to all, the periodic over-supply of caustic soda, the raw material advantages of the Southwest – these are the factors that are now forcing our industry to integrate.

RALPH M. HUNTER
Manager, Electrochem. Department, Dow Chemical Co.

Byproducts: that's the crux of all the problems the chlorine industry now faces. Hydrochloric acid – now a question mark – can become a headache. But the industry can find the answer to hydrochloric without much trouble: the modified Deacon process, which uses it and oxygen with a moving bed catalyst to make chlorine, is the one way out. Electrolysis of acid to chlorine and hydrogen is another. But what are we going to do about caustic soda? That's a matter we can't solve entirely alone – we don't have enough influence on the caustic-consuming industries such as soap, detergents, rayon-cellophane, petroleum. Will we have to degrade caustic soda into carbonate? Finally, we must remember this: new chemicals and chemical processes might some day topple chlorine's supremacy. Chlorine is not indispensable.

ROBERT B. MACMULLIN
R. B. MacMullin Associates, consulting engineers

How can we balance the demand for chlorine and caustic soda? Several ways stand out: make other types of alkali metals and compounds (K, Li, Ca, $NaNO_3$), use other raw materials (HCl, $CaCl_2$), get away from chlorine in some organic syntheses, change the pattern of caustic usage, drift away from metallic sodium in detergents and other industries, develop bigger markets for sodium in extractive metallurgy, put more flexibility into our production methods. How can we improve the operation and economics of our plants? We can develop improved vertical types of mercury cells, build cells in units of 100,000 amp. or more, use cationic diaphragms to produce pure concentrated caustic, find cheaper ways to purify brines, accelerate new trends in chlorine handling, revolutionize cell design by improving anodes. We can – and must – solve our problems by bringing our own engineering ingenuity into full swing.

Two Problems Plague Ammonia-Soda Alkalis

Producers must integrate with electrolytic alkalis, need ways to hike return on investment.

Trends in the ammonia-soda alkali industry revolve, to a large extent, on that coming headache of the chlor-alkali business: too much caustic soda.

As Wyandotte's Bob Semple puts it: "Many future happenings in the ammonia-soda alkali industry are highly dependent upon the inter-relationship of its products with electrolytic caustic and chlorine and with the growth curves of these two important chemicals." This is fast becoming a serious problem – a problem that's likely to reach a crisis before 1960.

Bluntly, the crux of the matter is this: A long-term super-saturation of the caustic-soda market, again in Semple's words, " . . . could well bring about major readjustments in the economics of major alkali products which could retard the continued expansion of chlorine production as a co-product with caustic-soda."

But Diamond Alkali's C. C. Brumbaugh points up another "hard fact" problem that's fast becoming acute: How to get a fair return on capital investment for new plants. He goes on to pinpoint the matter:

"The alkali industry is typical, as a new plant today operating at 90 percent capacity would give a net return after taxes of less than 1 percent on investment."

In spite of close to 100 years of experience with the process, the industry is faced with "a pressing necessity for technological improvements to lower investment costs . . . "

Otherwise, Brumbaugh continues, "American basic industry – including the alkali industry – is faced with obsolete plants and gradually rising costs from obsolescence and high maintenance."

The only sound and lasting solution calls for the use of chemical engineering ingenuity of the highest order.

ROBERT B. SEMPLE, *President, Wyandotte Chemicals Corp.*

C. C. BRUMBAUGH, *Director of Research & Development, Diamond Alkali Co.*

Sulphur: Higher Costs in Prospect

WERNER W. DUECKER
Manager, Research Department, Texas Gulf Sulphur Co.

If the problem is approached rationally from both technical and economic standpoints, industry can be certain of continued sulphur supplies in one form or another. Development of alternates for brimstone is mainly a question of economics. Sulphur is already being produced from gases containing hydrogen sulphide. Conservation of spent acid and waste sulphur dioxide is not yet complete. Mineral sulphides and sulphates constitute enormous reservoirs of sulphur supply, but as with the other alternates they are not fully exploited because until recently the supplies of cheap elemental sulphur have been large. Now the picture is different. The attempt at correcting the present short sulphur supply through allocations and price control is not a real solution. Only when a free market exists for sulphur and its alternates, where prices can adjust themselves, will we be able to make most effective use of our sulphur resources.

D. B. MASON
Technical Director, Freeport Sulphur Co.

The sulphur situation has improved decidedly since the shortage first developed late in 1950. Consumption is still limited by the government but some consumers are not taking their full allocations and substantial tonnages of new sulphur in various forms are coming into production throughout the world. The short-term outlook is better than at any time since 1950. But what of the future? The long-term problem is primarily economic. There will be higher development and mining costs for new elemental sulphur deposits, many marginal or in difficult coastal areas. Sulphur from alternate sources will play an increasing role unless great new salt dome discoveries are made. However, in most cases costs will be well above present ceiling prices for American brimstone. Once the law of supply and demand has been reinstated and sulphur is allowed to find its proper price level, among all sources there will be ample supplies.

For Sulphuric Acid, the Problem Is Raw Materials

JAMES A. BARR, SR.

Chief, Industrial Mineral Branch, Defense Materials Procurement Agency

The main problem of the sulphuric-acid industry is the task of supplying the constantly increasing demands of chemical and agricultural chemical industries in the face of the existing sulphur shortage. Until a year or two ago ample sulphur supplies discouraged the development of substitutes for Frasch-process brimstone. Most acid plants are geared to use brimstone and the transition from surplus to shortage, quite sudden as it was, caught the unwary by surprise. Still, there is no question of vast reserves of sulphur in forms other than brimstone, waiting behind a curtain of adverse economics. Exploration for new sulphur domes continues apace but depletion of existing domes still leads the new discoveries, mainly of marginal character. So we must plan to turn to the sulphides hidden in the Appalachians and elsewhere, to the several million tons of sulphur equivalent wasted annually with the coal we burn, to sour gases, waste acids from pickling and pigment processes, and eventually to western oil shales and to gypsum. And in so doing we must question our present acid-plant designs, for today's spread in capital cost between plants for brimstone and for the various alternates is too great considering the simplicity of the process.

THOMAS R. HARNEY

Manager, Engineering Sales Dept., Monsanto Chemical Co.

If it is true that the future will not provide enough elemental sulphur for sulphuric acid, then it is obvious that an increasing part of our acid must be made from other raw materials. Any such major change will have a very appreciable effect on acid cost since plants burning such materials carry a capital charge of two to four times that of a brimstone plant. Even if brimstone continues available – at undoubtedly considerably higher cost – this means higher cost acid because sulphur accounts for 70 to 80 percent of the factory cost of acid. In turn, this will be reflected immediately in price increases for many other products, both chemical and non-chemical.

All this means that economy in acid manufacture – as well as in plant investment – will take on greater importance. Plants which will waste less sulphur dioxide, and larger units up to 550 or 600 tons per day in a single unit, are already here. And yet, where conditions are economically right, the smaller "captive" plant is and doubtless will continue to be very much in the picture, although not at present useful for sulphur sources other than brimstone or refinery sludge acid.

F. J. BARTHOLOMEW

Sales Executive, Chemical Construction Corp.

Looking into my imaginary crystal ball I see sulphuric acid demand continuing – at higher prices – but still as the basic heavy chemical. I see some men scraping the bottom of the sulphur barrel, yet others are operating huge plants producing sulphuric acid or ammonium sulphate direct from gypsum. Still other plants are again running on pyrites as they did 30 years ago. Some are scrubbing sulphur dioxide from the stacks of centralized boiler plants to make acid and ammonium sulphate at a profit. Others are recovering elemental sulphur from refinery, coke-oven and natural gases and from low-grade sulphur ores. I even see success with the long-considered auto-oxidation process for the production of moderate strength acid direct by bubbling SO_2 through water in the presence of a catalyst. I see metallurgical developments leading to low-cost alloys good for wet SO_2 and weak acid – with the physical properties of carbon steel. And finally, as I look ahead, I think I detect the rise of the idea that sulphuric acid and its raw materials are precious natural resources to be recovered and conserved whenever possible.

The Rubber Industry Is Only Beginning

JOHN BLAKE
Director of Research, Simplex Wire & Cable Co.

The future is in synthetics. Natural rubber in a single chemical material, and we must accept the properties given us by the rubber tree. Synthetic rubbers are versatile. They may be made in a wide variety of types, and, within a given type, we can evolve numerous variations to adapt the material to each end-product use. Natural rubber has many defects. It does not resist oil, sunlight, ozone, flame, or the diffusion of gases. Resistance to oxidation and aging is limited. It will not stand high temperatures for long periods. With synthetic rubbers, we have materials that excel greatly natural rubber in each of the above properties. We seem to have just scratched the surface in the development of new rubbers. We have made more progress in the last five years than in the previous fifty. Natural rubber still excels in one property. It has higher resilience under flexing than any of the synthetics with comparable physical properties. Intensive research is underway to remove this one defect of synthetics. I have high hopes that this problem will be solved. I see vastly improved synthetic rubbers in the future. They will be used in many products where natural rubber could never be even considered. The number of possible rubber-like materials is infinite. I venture to guess that more progress will be made in the next ten yars than in the past fifty.

JOHN P. COE
Vice-President, Naugatuck Chemical Division, United States Rubber Co.

The rubber industry began seriously when chemistry brought about the thermosetting of the natural plastic called rubber. Increasingly, the rubber industry is dependent upon chemistry, using chemical manufacturing processes as well as depending on the chemical manufacturing industry for its basic raw materials. I believe the most outstanding problems which concern the rubber industry are those connected with the nature and the synthesis of basic elastomers. The past decade has demonstrated that such elastomers not only can replace the natural rubber gum but in many cases will perform in a superior manner both chemically and physically. Chemical knowledge in this field is increasing rapidly and it is now obvious that continued research will be productive of new synthetic elastomers far superior in various respects to those we have known. Accordingly, of greatest concern is research and subsequent commercial development in the field of the elastic polymers. The possibilities are very great and future progress at a rapid rate can almost be guaranteed. A deterrent to aggressive development is the continuing monopoly by the Federal Government tending to stifle the free enterprise support of such research. Nevertheless, I hope sufficient private investigations will continue so that the progress of chemistry eventually will put the Government out of the rubber business by making obsolete the fields in which the Government is now engaged.

JOHN T. COX, JR.
Consulting Chemical Engineer, Washington, D.C.

Transportation uses 70 percent of the annual rubber production, both natural and synthetic. Transportation rubber has to meet the most exacting standards because of the gruelling performance demands of the final product. When these demands are met, through raw material characteristics, all the other products of the rubber industry, whose performance demands are less, benefit tremendously from the high qualities present in the new polymers or techniques. The rubber industry will face, in the next decade, the demand for a tire that will be capable of operating safely and continuously at 100-125 miles per hour on the super highways that this great nation will continue to extend as urban traffic pressure grows. Today, there is no known polymer, or compounding technique for natural rubber, that will give an automotive tire continuously safe operating characteristics under high load conditions at these speeds. The technology to meet this demand has not yet been devised, and the demand is insatiable. This super polymer, or technique, can only develop under a system of competitive research, and when it develops, filling the demand for this single great use, the product will possess such tremendous characteristics that all other rubber users will benefit. The future of the rubber industry is kept bright under the continuous stimulus of competition and free enterprise.

Synthetic Rubber, Too, Has Its "Ifs"

BRADLEY DEWEY
President, Dewey and Almy Chemical Co.

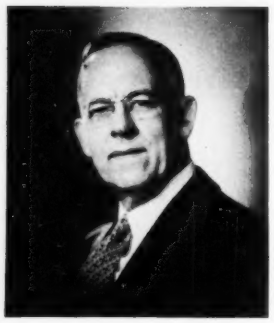
The ultimate future of synthetic rubber is a three-part problem. It is all very well to turn polymerization facilities over to private industry and to talk of allowing small rubber companies to band together to own a few plants, but what about the small rubber user who is too small to think of owning even a share of a plant and yet must compete with large firms doing their own polymerizing? What is to be done to insure a supply of styrene from the now privately owned styrene plants of Dow, Monsanto and Koppers without multiple profits and taxation making for inordinate costs? Further, if the government continues to own butadiene plants, who will guarantee an adequate supply of competitively priced butadiene for all who buy or want to build new polymerization plants? Finally, what about butyl? If plants are sold, who will own partially amortized facilities? Will their prices permit competition with new higher-cost plants? Synthetic rubber demands statesmanlike thinking and *action now!*

HOWARD E. FRITZ
Vice-President, Research, The B. F. Goodrich Co.

The problems today, are higher speeds, heavier loads, greater impact, wider temperature ranges, more severe service all down the line – in tires, belting, de-icers, hose, and other products. New rubbers, new textile fibers and new pigment materials will be needed to meet this challenge. It is unlikely that one outstanding man-made rubber will be developed which will meet all the requirements of the industry with regard to temperature range, toughness, flexibility, processability, elongation and resistance to abrasion, light, heat and oxidation. We will, in the years ahead, make use of and improve the properties of many polymers, pigments and materials now known, and develop new ones from which we will select those which yield finished products surpassing in service anything heretofore used. The basic raw material for this industry will never again be limited to natural rubber.

R. P. DINSMORE
Vice-President, The Goodyear Tire & Rubber Co.

The rubber industry like all competitive industries, can only insure its future by constant attention to the correction of the economic weaknesses of its basic materials, and by the steady renewal of its energy and enthusiasm through the addition of a systematic supply of youthful participants. In the realm of raw materials, rubber suffers from inability to get perfect dispersion of its best toughening agents; by the very imperfect elasticity of its vulcanized products; and by the susceptibility of the latter to the effects of sunlight and ozone. It is essential that these difficulties be corrected by aggressive research, and be accompanied by improvements in textiles in order to meet the future stringent demands for improved performance in tires, belts, hose and other equipment. Where textiles are used, greatly improved bonding is essential and improved resilience to conform to the better rubber. Lastly, we must free ourselves from the atrophying influence of government control.



HARRY L. FISHER
Research and Development Branch, Synthetic Rubber Division, Reconstruction Finance Corp.

Synthetic rubbers that require no carbon black for high resistance to abrasion have already been made. If these can be developed and made on a large scale, tires and other goods would be better than today. Synthetic rubbers may be manufactured at more rapid rates than at present and will require much less equipment for the same amount of product. They will probably be manufactured faster, better and cheaper. Laboratory testing of tires is likely to be so good that big test fleets of automobiles just for testing tires will no longer be required. New anti-oxidants and anti-ozones are likely to be found and added to rubber to cause it to last a long time. Odor may be entirely removed from rubber goods. If no carbon black is used in tires, then any color can be achieved especially with tires to match or complement the color of a car. Synthetic rubber tires are likely to be manufactured with very little or no fabric. Tires may last the life of a car.

Raw Material Supply Shapes Paper Progress

Expanding output highlights the need for increased supplies of wood, water and power. Research will provide more efficient utilization.

Leaders in the pulp and paper industry are unanimous in stating -- the continued supply and optimum utilization of wood is of paramount importance. Ever increasing demands for pulp and paper products underscore the significance of this statement. R. G. MacDonald looking to the future says, "When you mention the next fifty years it is apparent that national population growth and distribution will make demands on all industries and foresight is important in meeting these changing conditions."

Although fortunate in having a self replenishing raw material, the paper industry is using foresight greatly to improve the natural replenishment process. Wood is now grown as a crop in forest areas referred to by R. S. Hatch as "tree farms." Harvesting on a time cycle and scientific selection of trees provide a perpetual supply with increased output per acre.

Still higher output of better quality wood per acre of treeland is envisioned for the future. The approach to this as seen by Allen Abrams and Harry F. Lewis is the development of fast-growing hybrid trees that will be both insect and disease resistant. Growth might be still further stimulated by using induced rainfall.

And to modify the characteristics of the standing tree, John D. Rue foresees chemical treatment to reduce rotting tendencies, make the bark easier to remove and improve the floatability for water transportation to the mill.

Not content simply to improve wood supplies Allen Abrams looks to the day of completely mechanized logging. While increasing man-day output this practice would also reduce damage to residual stands, allow bark removal in the woods to save on transportation cost, and make logging jobs attractive to younger men.

Increased utilization of the pulp wood for maximum yields of cellulose fiber is the focus of continual development work. Need for this is emphasized by the rate at which pulp production is increasing. In 1951, 16,528,000 tons of pulp were produced which was an increase of 1,500,000 tons over the previous year. In 1952 another million tons of production will be added to this output. Since wood supply is a pressing problem the progress made in improving pulp yields is most encouraging.

Achievement of higher yields is being realized through the use of improved refiners which can successfully defiber in the presence of greater amounts of lignin than previously. This is leading into the development of semi-chemical processes of delignification which remove only a portion of the lignin material formerly extracted by the chemical processes, thus making a greater proportion of the raw material appear in the final product. Also smaller amounts of valuable chemical are required.

Another advance aimed at easing the wood supply situation has been the modification of pulping procedure to permit pulping hard wood species.

To improve the economic aspects of the pulping operation it would be very desirable to find means for the large scale utilization of the lignin. Crude lignin now finds use as a dispersing agent and binder while further refinement produces a tanning agent. Chemical conversion into pure chemicals such as vanillin and vanillic acid offers another possibility. Pursuing this objective still further would very likely transfer lignin from the liability to the asset side of the ledger. Even a relatively small return from lignin would make it possible to use the carbohydrates present in the vast amount of wood waste such as tops, limbs and sawdust for the production of industrial alcohol and other fermentation chemicals. Lignin would thus make alcohol from this source competitive with petroleum or agriculturally derived alcohol.

Licking the waste disposal problem is a real challenge to the industry in view of the increasing acuteness of water supply and tightening pollution laws. Progress in this direction is being greatly aided by equipment manufacturers.

However, these steps forward are only the start of sweeping changes yet to come. Original trends of thought reported by our industry spokesmen point toward some of the possible developments.

C. C. Heritage emphasizes that present pulping practice is designed for pulp production only, with utilization of the solubles as a secondary and minor consideration. Harry F. Lewis supports this thought by noting that the present high degree of delignification is essential to the separation and hydration of the fibers. Hydration in turn is necessary for developing the adhesive properties of the

HARRY F. LEWIS, *Research Associate, The Institute of Paper Chemistry*

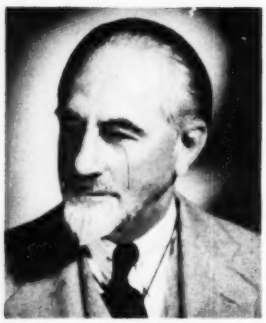
R. G. MACDONALD, *Secretary-Treasurer, Technical Association of the Pulp and Paper Industry*

ALLEN ABRAMS, *Vice President, Marathon Corp.*

R. S. HATCH, *Acting Director of Research, Hudson Pulp & Paper Corp.*

CLARK C. HERITAGE,
Director of Development, Weyerhaeuser Timber Co.

JOHN D. RUE,
Consulting Engineer, Tacoma, Wash.



fiber. Heritage further notes that the hydration step which prepares the fibers for making a good papermaker's bond actually affects all the other sheet properties, resulting in a compromise in the final product.

Several avenues of approach to these problems have been proposed. Heritage would change the basis from one of pulp production to a complete overall utilization of the raw material. Such a changeover might conceivably be based on a continuous chemical process from log to finished cellulose product. Or from John D. Rue's viewpoint this could be achieved by a stepwise breaking down of the wood substance and conversion of the resultant byproducts to valuable end products. The last step in such a process would produce high grade pulp.

Once the pulp was obtained, the hydration step might be eliminated by the development of a tough quick-setting adhesive to form the paper maker's bond.

And another slant on the same subject is put forth by Dr. Lewis who feels the need for an entirely new pulping process. The hope would be to use steam at or below atmospheric pressure to convert all the cellulose and desirable hemi-celluloses to pulp. Maximum lignin content permissible for use requirements would be retained. The process should be free of stack odors, fly ash and oxygen consuming effluents.

Along the same vein, such a high lignin pulp could then be surface bleached while at the same time securing additional lignin removal.

And finally Dr. Lewis suggests a radically new type of paper machine to air-form the sheet at high speed. Fiber bonding would be accomplished by an adhesive binder that could be modified to alter sheet characteristics. The enormous advantages of such equipment would be in the elimination of large quantities of water and dryer steam. Stream pollution from white water would no longer be a worry.

These then are some of the more important problems of the pulp and paper industry. The proposed answers, some of which seem fantastic today, may very well become tomorrow's realities.

LEATHER'S PROBLEM IS SOURCE OF SUPPLY

The leather industry's fundamental problem is that its raw material is a perishable byproduct of the meat industry. The supply of hides and skins can not be augmented when the demand for leather increases. Strong markets for leather force hide and skin prices to such high levels as to create serious consumer resistance. Although high prices and shortages are currently corrected, well planned campaigns to promote new or improved leathers can drive prices up.

Leather possesses unique properties not found in substitute materials but its potential volume is limited. Its future, therefore, lies in the most efficient use in fields where its properties make it outstanding. Tanners will concentrate on tailor-made leathers for which they can expect a price which will underwrite production and development costs as well as assure adequate profit. This will involve utilization of the most up-to-date techniques and materials.

KENNETH E. BELL, *Vice President, A. C. Lawrence Leather Co.*

EQUIPMENT DEVELOPMENT MUST STOP LAGGING

The greatest problem before our chemical process equipment people today is to correlate their development work so as to take advantage of the advances of science in a variety of fields.

The problems of separation of finely divided solids into classes according to weight or settling rate has been studied a long time with many advances made. But new methods may be found based on problem analysis, much as the fluidizing process for giving the maximum means of contact in solid-gaseous reactions has reorganized our ideas on roasting as well as other operations and reactions. This problem comes in when finest comminution or reduction of particle size is required with the benefit of the efficiency of continuous over batch operation.

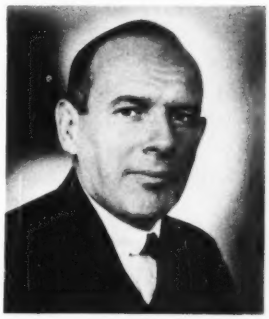
JOHN V. N. DORR, *Chairman of the Board, The Dorr Co., Inc.*

Fiber Industry Needs Research to Reach Full Growth

A. E. BUCHANAN, JR.

Asst. Gen. Manager, Rayon Dept., E. I. du Pont de Nemours & Co., Inc.

The industry faces a long period of continued expansion. It looks as though synthetic fibers are apt to become more and more specialized. We will get further away from the specious concept of a universal fiber. In the brief lifetime of nylon, the concept of functional fibers – that is the designing of molecular structures to produce desired inherent physical properties – has been widely recognized as a practical route to radically new and superior textile products. This concept is stimulating feverish activity in the fiber-minded segments of the chemical industry, which will inevitably result in more growth. Dramatic things will happen in the next 25 years as the textile industry realizes what it can do with the techniques the chemical industry uses – long-range research, continuous obsolescence of the old by the new, long-range planning for sustained operation and earnings.



CHARLES S. VENABLE

Director of Chemical Research, American Viscose Corp.

Swift and intelligent assignment of fibers, natural and man-made, to the particular end uses for which each is best suited – that's an outstanding problem in the textile industry's future. The field is progressing fast. Five new textile fibers have been introduced in the United States since V-J Day and more are undoubtedly scheduled for the near future. Important improvements are being made in the older synthetics like viscose and rayons and in the natural fibers. The industry can avoid much sweat, blood and tears if the fiber producer, the fiber processer, the fabric designer and manufacturer and the fabric finisher will cooperate in determining as accurately as possible (1) the textile characteristics of each fiber and (2) the fiber requirements for each textile purpose, and will then engineer each textile product accordingly.

W. H. CHARCH,

Research Dir., Pioneering Research Lab., E. I. du Pont de Nemours & Co.

The advent in recent years of the newer group of synthetic fibers points up as never before the need for improvements in wet strength, wet form stability and crease resistance of viscose fibers. These properties are largely inherent in the synthetics, but they will have to be built into viscose fibers through research. And when the problem is viewed against the background of our rapidly expanding chemical and polymer technology, it becomes clear that each passing year improves the opportunity of the research man to bring basic advances in these properties within reach of the viscose process or its products. This is research opportunity of the first magnitude where technical success should result in industrial rewards of the highest order.

OSBORNE BEZANSON,

President, Chemstrand Corp.

The next fifty years should witness a tremendous expansion in end-use applications of synthetic fibers by the textile industry. The optimum blends of textile fibers, synthetic and natural, in finished fabrics have yet to be discovered. Continual research and development of new and better fibers is indicated. Many matters of technical and process nature require additional exploration. On the basis of progress to date and in the face of increasing population, higher per capita fiber consumption and the resultant requirements for new fibers to supplement existing ones, the future of the synthetic textile fiber industry holds real promise of continued expansion.

Fertilizers, Too, Must Change

HARRY A. CURTIS,
Director,
Tennessee Valley Authority

PAUL D. V. MANNING,
Vice President in Charge of Research, International Minerals and Chemical Corp.

VINCENT SAUCHELLI,
Director of Agricultural Research, Davison Chemical Corp.

FRED S. LODGE,
Secretary and Treasurer, National Fertilizer Association

Industry needs more chemical and agronomic research, better public relations and educational program

Few industries are beset with more problems than the manufacture of fertilizers and agricultural chemicals. Change is the order of the day, the keynote to survival. In the blunt words of the industry's great friend and severest critic, T. V. A. Director Harry A. Curtis—"the fertilizer industry is no different than other large industries—it must change, and if any of its present members are too slow or too dumb to change, they are certain to be replaced, and soon."

Research, as pointed out by Vincent Sauchelli, is both the means and the motivating agency of change in the modern world. Increasing emphasis on lower unit costs of production through higher yields per acre and larger output per man-hour pose these outstanding problems for research:

1. ***How crops feed.*** Fundamental studies supported by industry are needed in order that farmers can learn how to use plant foods more efficiently.

2. ***Nutrient concentration.*** Since demand is for fertilizers of more concentrated nutrient content, manufacturing and agronomic problems must be resolved because of recognized economic advantage.

3. ***Nitrogen carriers:*** Here research must produce high-analysis solids with satisfactory physical properties for formulation and direct application, yet resistant to rapid leaching from the root zone.

4. ***Phosphates:*** New practical processes for acidulating rock with other acids than sulphuric are needed for producing concentrated phosphates compatible with ammoniation requirements.

Dr. Paul D. V. Manning adds "From the standpoint of greatest value to the farmer, multiple superphosphates and ammonium phosphates should make obsolete the production and use of ordinary superphosphate. Intensive research is bringing results in the elimination of sulphuric acid but usually with the production of more concentrated fertilized compounds, emphasizing again the importance of securing public acceptance of such ingredients."

Another long-range problem reported by Dr. Curtis "stems from the research now in progress that is revealing much new information on the relationship of soils, growing plants and inorganic plant nutrients. Sooner or later the fertilizer industry must produce fertilizers that more nearly meet the newly discovered requirements."

How big the future? NFA's Fred Lodge quotes government estimates that "by 1975 there will be 38 million more people to feed than in 1950." With not much more suitable land available on which to grow crops, he estimates "we must produce on five acres as much as we harvest now on six. To accomplish this . . . greatly increased amounts of plant food must be applied." Vincent Sauchelli says "The trend line of growth for the fertilizer industry leads in 1975 to a production figure of between $2 and $4 billion and that of agricultural chemicals to between $250 and 350 million."

Again quoting Mr. Lodge: "The U. S. Department of Agriculture has asked the fertilizer industry to furnish by 1955 a total of 70 percent more nitrogen, 55 percent more available phosphoric acid and 55 percent more potash than was used in 1951." Plants now building will probably meet the nitrogen and potash needs—but the shortage of sulphur is the most serious problem of the phosphate industry just as it is of practically every chemical manufacturer.

Meanwhile the fertilizer industry must push ahead with both fundamental and applied research. At the same time it cannot overlook the need for educating its public—and the American people as well—on the indispensable role of chemicals in the production of more abundant nutritious food.

More Education, More Potash

Further and more intensified education of the farmer-consumer to make certain he fully understands the essentiality of potash in profitable crop production—that is the industry's No. 1 problem. We are making progress. Last year's output of potash salts was 2,411,500 tons—almost exactly twice what it was in 1942. And the fact that the farmer has used this rapidly mounting production would seem to indicate that he is already aware of the value of potash. But in too many cases the farmer still follows blindly the old custom of setting aside a fixed percentage of his income from one year for fertilizer purchases the next year. Instead he should be informed as to the functions of potash as a plant food with reference to specific crops and its proper ratios to other plant foods. Only in this way will he realize maximum profits in crop production.

It is almost exactly 35 years since I published my first potash article in "*Chem. & Met.*" But the industry has never had more promising prospects.

JOHN W. TURRENTINE, *President-Emeritus, American Potash Institute*

Agricultural Chemicals Cast for Major Role

O. V. TRACY,
Director, Chemical Division, National Production Authority

The push button farm is as far from realization as a push button army. In each activity, however, much progress is being made in mechanization and the introduction of devices to lessen dependence on human beings. Chemicals will continue to play an increasingly important role in such programs. Faced with a growing population and a greater need for food from a limited acreage, the chemical industry will have an increasingly important responsibility to agriculture in the future.

American farmers have learned that it pays to protect their production investments by using insecticides and fungicides. The annual production of chlorinated insecticides, which have been in use only a few years is now about 400 million pounds. It is estimated that the United States makes about 80 percent of world production. Foreign needs could probably best be satisfied by low-cost U. S. production of high quality pesticide chemicals and the establishment of formulating plants abroad.

Many new pesticides are being introduced. Some have greater specificity, superior insecticidal action or lower toxic effect on warm-blooded animals. The process of developing a pesticide, is expensive and time consuming and is always faced with the possibility of displacement before it has returned its investment.

In addition to insecticides and fungicides, other agricultural chemicals such as soil and grain fumigants are growing in importance. There is also an increasing use of defoliants and herbicides because they permit mechanized harvesting and curtailment of farm labor.

From the viewpoints of economic stability of American agriculture as well as world needs for food and fiber, it appears that the future of agricultural chemicals is bright. The availability of such chemicals may spell the difference between feast or famine, health or pestilence, world stability or unrest.

P. H. GROGGINS,
Chief, Agricultural Chemicals, Chemical Division, National Production Authority

The overall problem has been summed up very well by Fred Lodge as follows: "Our agricultural economy is such that the necessary food cannot be produced and preserved without the use of fertilizers, pesticides, weedicides and additives. . . . The problem of most general importance to the agricultural chemical industry is the determination of the proper and safe use of new chemicals in the production and processing of foods. Sufficient research must be undertaken to determine the limits of safety for acceptable use of new chemicals and at the same time the safeguards necessary to protect the health of the nation. In addition, the use of legitimate chemicals in the production and processing of food should be protected from unproven, unfair, and often merely emotional statements and claims completely unfounded and erroneous as to the deleterious effects of such use. Our present and future goals of food abundance can only be attained through the maximum use of productive and protective chemicals."

Needed – More Plastics as True Engineering Materials

D. S. FREDERICK
Vice President, Rohm & Haas Co.

In common with the rest of the chemical industry, the resins and plastics industry will be influenced in the future by the availability of adequate financing and technically trained manpower. From an engineering standpoint, however, we need to develop more plastics which can be considered true engineering materials. Today a large percentage of our plastics are still used in the manufacture of novelties, toys and gadgets rather than in truly industrial items which are expected to have an appreciable useful life.

There are some work-horse plastics which have been employed for years in real engineering applications . . . such as the phenolics, which are used in electrical parts, the vinyls which are used in electrical insulation, and more recently the acrylics which are used in automotive lenses. However, a large number of plastics are not used primarily because of their engineering properties, but rather because of their brilliant colors and their ability to be converted into mass production items at low cost.

J. S. BEEKLEY
Research Director, Polychem. Dept., E. I. duPont de Nemours & Co., Inc.

Our industry, of course, faces difficult problems in research, in manufacture, and in sales, and our future progress depends upon our success in solving them. As a research director, I feel that our outstanding problem is to put each phase of our work with polymers—research, development, manufacture, and fabrication—on a sound scientific basis. When we have done so, we shall be able to relate the molecular constitution and structure of polymers to their properties in use. We shall then know what uses the new polymers uncovered in research may have. Also, we shall be able to work our way from the consumer needs which plastics and resins might satisfy back to the syntheses of suitable polymers.

Earnest workers have already contributed much toward the solution of the problem, but further intensive endeavor is required in the field of polymer science.

D. F. SIDDALL
Director of Research, United States Stoneware Co.

There exists in the resins and plastics industry, as in many others, a grave and threatening shortage of technically trained personnel. We are faced with the lack of quantity, and specifically in the field of polymer chemistry, a need for better quality. As a result of this shortage, many standards of the industry with respect to qualifications are being lowered, which is likewise detrimental to our progress. The academic training of chemists and engineers have yet to pin-point the needs of the resin and plastic industry but progress is in the making. Industry must remodel many of its new technicians but cannot train that which is non-existent in numbers and is laboring under a handicap of training on the job with progress still to be evident.

More and better chemists and engineers, with a sound broad background in the basic fields, with an appreciation of the specific problems and techniques of the plastics and resins industries, will insure our future accomplishments.

M. G. MILLIKEN
Vice President, Hercules Powder Co.

The growth of the plastics industry has been along a geometric curve from 50 million lbs. in 1937 to 2,500 million lbs. today. Manufacturers of the basic materials have recently completed a new cycle of expansion for all types of material. We are in the process of assimilating this outpouring of materials. With few exceptions, all plastics are in ample supply.

Production of molding and forming machinery has kept pace with this amazing growth. Machines have been vastly increased in size and new production techniques, such as vacuum forming, provide added large-volume means of converting materials into finished goods.

The application range of today's materials has put new markets within our reach. New materials and new processes will make better plastics available and their position in commerce more permanent.

J. L. HUSCHER

Technical Director, American Agile Corp.

Although several of the high-grade plastic materials were developed for the express purpose of resisting severely corrosive conditions, certain unfounded prejudices seem to prevail in the chemical process industries against the use of these materials in the construction of chemical processing equipment and equipment parts.

Yet there exist in the various phases of the chemical industry innumerable applications where plastics will outlive by far the presently used construction materials and protective coatings. Some typical applications include storage and processing tanks for the various acids and alkalis; exhaust hoods, ducts and fans fabricated entirely from plastic materials; pipe and sewer lines for handling of a great variety of liquids and chemical wastes; valves and pumps of all types and designs.

Promoting a better understanding of the various plastic materials available today and in days to come, of the proper fabricating methods, and of their proper place in the field of technical corrosion protection, will be one of the main tasks confronting the plastics and resin industry.

E. R. HANSON

Director of Plastics Dept., Foster D. Snell, Inc.

There will be continued rapid expansion in the uses of resins and plastics, particularly in the building and structural fields. Conduit, pipe, structural members, partitions, flooring, electrical and heat insulation, furniture, curtains, drapes, window shades, wall paper, toys, appliances and fixtures are some of the applications that will be made in increasing quantities from resins and plastics. To continue this rapid expansion, the industry must develop new resins that are tougher and have a higher resistance to heat distortion, particularly for larger pieces. These resins must be of reasonable cost and easily processed. Technicians in the many laboratories will have to provide new formulations and procedures, not only for new resins but also to take better advantage of the inherent properties of the resins now available.

With the trend to larger pieces of close dimensional tolerances and faster production cycles, manufacturers must supply equipment necessary for forming the plastics. Larger injection and compression molding presses, high capacity extruders, faster and larger calenders and auxiliary equipment will have to be designed and built. The problem of controlling temperatures uniformly over large areas must be solved.

RAYMOND B. SEYMOUR

Exec. Vice. Pres., The Atlas Mineral Products Co.

Indiscriminate selling, processing, and application of plastics based on fantastic claims have made some consumers skeptical of anything associated with plastics. Leaders in the industry have belatedly established a policy of using plastics for appropriate end uses only, but have done too little to implement this plan.

The solution . . . may require a de-emphasis of accepted nomenclature followed by the introduction of new names and the development of brand consciousness. The former technique proved invaluable to the infant rayon industry some years ago when artificial silk had a connotation similar to that given to plastics today. The other technique has been successful in the clothing and automobile industries.

The more enlightened firms should employ additional technologists to correct the existent shortcomings in their products. It may be necessary to postpone more glamorous research and discourage the dissemination of fantastic half-truths in both trade journals and Sunday supplements. It is essential that the deficiencies of plastics, as well as their advantages, be emphasized.

Research the Keynote in Ceramics and Glass

A. I. ANDREWS

Professor of Ceramic Engineering and head of the department, University of Illinois.

During the past 25-30 years the application of science and engineering to the many branches of ceramics has led to great advances. This is the key to the future, based on a continuing research program which is spreading throughout the industry and leading to many promising new improvements and new products. Almost unlimited as regards the supply of their raw materials, ceramic products are readying themselves to take over in many instances from metals which are becoming more critical from year to year. Then, too, the advent of atomic energy and its extremely high temperature needs places a unique load on ceramics. Research and more research, development and more development, will provide the fundamental information, data and know-how to enable ceramic products to rise to the new demands that will be put upon them. At the moment, at least, the industry's greatest problem is one of technical manpower.

EDWARD E. MARBAKER

Senior Fellow on Ceramic Industry Problems, Mellon Institute of Industrial Research.

Since ceramic engineering began to come into its own, about 1920, the ceramic industry – based on ancient art – has brought about increased production of better goods at lower cost. Looking toward the future, the ceramics industry eyes the inexhaustible supplies of clays and minerals with which we shall help to overcome the decreasing supply of metals. Even now ceramic coatings – which will permit use of steel and alloys at temperatures far higher than the metal alone can stand – are coming from the combined resources of basic sciences and engineering techniques. Ceramic industries of the future will apply the advancing methods of physical science and technology to the study of their raw materials, their actions and reactions in various combinations, and their better utilization for the satisfaction of human needs and for development of higher living standards.

S. G. OGBURN, JR.

Vice President in Charge of Research and Development, Foote Mineral Co.

One of the main problems of the ceramic industry is the development of low-maturing bodies, glazes, enamels and frits which will improve the economic position of ceramics by shortening heating-time cycles. New products and processes will open whole new fields of application, for example, in competition with certain chemicals and with organic and inorganic coatings for non-ferrous metals. Low-temperature glasses have already shown superiority to sodium silicate as a bonding agent for weld rod coatings. As bonding agents for abrasive wheels, refractories and related articles, another new field is being opened for replacement of inorganic and organic chemicals. Another challenging problem lies in development of better and more economical ceramic raw materials – lithium, borates, rare earths, zirconium and titanium compounds, for example. Other problems of great potential importance lie in further use of modified glass fibers in plastics and textiles and in development of still better chemically resistant enamels of improved adherence and thermal expansion qualities. Even more than most industries ceramics must "gear its future" to scientific research and development.

Glass as an Engineering Material

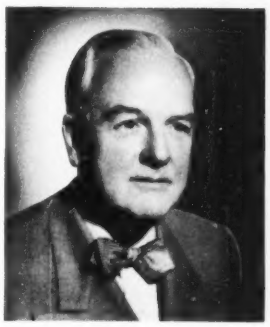
GAMES SLAYTER
Vice President in Charge of Research and Development, Owens-Corning Fiberglas Corp.

Outstanding among the problems of the glass industry is the mastery of techniques for capturing the inherent high strength, impact resistance and other desirable properties that glass is known to possess. To the layman, glass is a brittle, fragile material with a tensile strength of only about 10,000 psi. Yet in fiber form it becomes soft and pliable, with tensile strengths as high as half a million psi., resistant to impact in a remarkable manner. Other outstanding problems lie in developing methods for preventing propagation of cracks and imperfections; in putting improvements to work in massive glass structures such as large containers, glazings, and particularly in stress resisting parts. Once these problems are solved, glass – with its corrosion resistance, permanence, abundance and low cost – will give us a truly remarkable engineering material.

U. E. BOWES
Research Administrator of Owens-Illinois Glass Co.

The glass industry also has some very practical problems that lie close to the day-to-day task of the glass maker. More information is needed on its basic structure – more than can currently be provided by X-ray analysis and other radiation methods which have not satisfactorily clarified the atomic arrangement. Further information is needed on the structure of the glass surface. Manufacturing problems would be aided by development of mold metals which would not stick to glass at perhaps 300 deg. F. higher temperature; and by the advent of refractories which, in contact with glass, would be as good as present materials, but at say 200 deg. F. higher temperature. Finally, the industry needs more efficient equipment for making raw producer gas from a wider range of coals, particularly as natural gas becomes diverted to domestic heating.

Silicones Look to Lower Costs



W. R. COLLINGS
Vice President and Gen. Mgr. Dow Corning Corp.

Substantial reductions in the prices of silicone products are essential to our future progress. But production volume must be increased several fold in order to get our manufacturing costs down substantially. In most all areas where the use of silicones has penetrated, an unusual amount of technical assistance and technical work by our customers has been necessary. Hence, the present inadequate supply of engineers and other technical people may interfere with the development of markets for our products.

From the standpoint of sales developments our greatest problem is to educate and inspire potential customers to do things in new ways. Almost every use of silicones that we have developed has required that someone abandon an old practice and adopt a new one. So I would say that education of potential customers is our greatest future problem.

E. G. ROCHOW
Chemistry Dept., Harvard University.

Since the silicone field is comparatively new, and because there are no related natural products to be considered as models, a great deal of physico-chemical research on the structure of silicone polymers is necessary before we can explain their behavior. However, as soon as an explanation is available it will suggest ways of obtaining new and more useful materials.

In view of the abundance of silicones and the relative simplicity of the finished silicone polymers, there still remains a great challenge to find new and more economical methods for preparing organosiloxanes and their intermediates. The application of more engineering methods to the present methods of synthesis should bring about marked improvement, but it also seems essential to search continually for completely new reactions which would enable the synthesis of silicone polymers at a far lower cost.

Coming—Paints of Higher "Build" Tailored for the Job

KENNETH TATOR

President, Kenneth Tator Associates

For the future, paint materials will be formulated and promoted specifically for each of the various common types of industrial exposures, rather than continuing past practices of promoting a single compromise formulation for all industrial uses regardless of exposure.

We may no longer ignore the fact that optimum maintenance paint performance requires at least 5 mils thickness over the base steel. . . . No more than a three coat system is practical for general industrial maintenance painting. These two stipulations then require . . . paint materials . . . which will easily yield an average of at least 1.67 mils dry thickness per coat. Maintenance paints currently offered today average only 1.2 mils per coat, well below the lower limits for dependable performance. As a consequence the future will see . . . increased activity among paint formulators to increase . . . "build" in their products without sacrifice of resistance and durability.

FRANCIS SCOFIELD

National Paint, Varnish and Lacquer Association

The characteristic of the industry which should dominate it during the next fifty years is that it is emerging from an old art into a relatively new science. Much of our present knowledge is empirical and founded on extensive trial and error. We know relatively little about the fundamentals of the formation and deterioration of coatings, about the mechanics of adhesion and flexibility, and about the engineering aspects of dispersion.

The over-riding development of the next period should, undoubtedly, be a step-wise, but continuing exploration of the fundamental chemistry and physics of the process of film formation, both by solvent evaporation and by oxidation and polymerization. A more extensive knowledge of the nature of the processes with which we are dealing will enable us to develop raw materials which are tailored to the conditions they must meet. It will also enable us to synthesize new materials whose chemical nature favors the reactions we want and discourages those we do not desire, instead of using materials which happen to be available.

Similarly, if we knew more about the processes involved in the deterioration of coatings we could develop coatings which are resistant to those processes much more readily than when we must rely on empirical trials which require long exposures and which must be repeated for each slight variation in formulation.

N. E. VAN STONE

Vice President, The Sherwin-Williams Co.

The paint industry is keeping up with the fast pace of this chemical century by using the new synthetic raw materials made available by the chemical industry. The myriad of copolymer latices, resins, pigments and other new raw materials available for the protective-coatings industry are arriving almost faster than the industry's laboratories can formulate, test and properly evaluate them.

There is an increasing demand that the paint industry produce protective coatings of all types with an eye to increasing protection and enduring beauty. These products must also have good package stability, be more easily applied than heretofore under all general painting conditions and insure improved span of life with greater ease of cleaning the surface than ever before.

This demand for quicker and easier methods of application and greater ease of cleaning carries along with it the increasing demand for more attractive colors, with durability better than ever before.

E. R. ALLEN

Research Specialist, Rutgers University

It is reasonable to expect that the coming 50 years will see further improvements in methods of pigment dispersion and in physical properties leading to increasingly expanded fields of usage. With all the desirable properties of titanium dioxide, it is not impossible to visualize the development of an even superior product.

In the field of organic pigments marked advances are visualized as this branch of technology moves away from that of an adjunct to the dye industry into an important position closely integrated with inorganic pigments. The synthetic work, directed toward producing superior products, from which a minimum number of pigments will be selected with the assistance of physical optics, will prove increasingly productive.

Increased realization will develop that the manufacture of an inordinate number of synthetic products, so effective in the dye industry, becomes unwieldly in the pigment industry. Continued improvement in physical properties is a vital requirement of pigments; this requires reduction in numbers of commercial products.

As the basic principles of the processes become better understood, further progress is to be expected in the incorporation of engineering methods into manufacturing operations for the larger volume items with resulting economy and improved quality control.

DAVID E. LONG

President, David E. Long Corp.

One of the greatest problems is the development of new high flash point solvents for vinyls, acrylics, synthetic rubber, and others of the new high-polymer plastic resins. Many of the present coatings are limited in their applications due to solvent problems such as fire hazards, toxicity and objectionable odors.

Another major problem is in educating plant engineers in the value of proper application of these newer type coatings. Since the cost of application is the greatest part of any paint job, the coating should be selected not in terms of cost per gallon but rather on the basis of what it will do in each specific instance. A careful analysis of each painting problem should be made to determine what coating should be used to obtain best results. Most of the companies in this field offer technically trained men to assist plant engineers with their problems.

Very closely connected with this problem of proper application is that of finding best methods for economically and properly removing old coatings, and preparing surfaces for new ones. This field deserves considerable study and is one that has been very much neglected.

R. P. DEVOLVY

Technical Director, C. A. Woolsey Paint & Color Co.

The paint industry must convince itself and its customers of the merits and economics of using protective coatings, instead of decorative paints, where prevention of corrosion or other severe degradation of materials is concerned.

The many new raw materials available to the paint manufacturer have resulted in the formulation of a wide variety of good protective coatings capable of solving many of industry's maintenance problems.

If the maximum benefit is to be obtained from these new coatings, paint men must be uncompromising in demanding proper surface preparation, good application and adequate film thickness. The paint man's job only begins when the paint is sold. He must follow through and see to it that every one connected with the application procedure is fully informed, and, if necessary, be prepared to supervise the application.

Paint is now an engineering material and under a given set of conditions its performance is predictable. The acceptance of this fact by industry and particularly by the designers of new plants and equipment will go a long way toward reducing future maintenance costs. A well known authority on corrosion costs has recently stated that doubling the life of a protective coating permits paying four times more for it in the first place.

Gas & Fuel Industry Looks to Coal for Survival

A. R. POWELL
Assoc. Mgr. Research Dept., Koppers Co., Inc.

Many of the outstanding problems involved in the future of the three mineral fuels – coal, petroleum and natural gas – will have to do with the increasingly important function of these materials as sources of carbon and hydrogen for our astoundingly fast growing organic chemical industry. The dual role of these mineral fuels is becoming increasingly evident, that is, the combustion of the major portion to give us 95 percent of our heat and power requirements plus the conversion of a minor portion to those coal chemicals and petrochemicals that are becoming increasingly important as chemical building blocks.

Another situation, now only dimly discernible but that will grow clearer with the passing years, that is setting the stage for important problems of the future, is the prospect of decreasing availability of petroleum and natural gas. The problems involved in the conversion of coal and oil shale into synthetic substitutes and, in some cases, the substitution of coal itself for the two fluid fuels will eventually be concerned primarily with their uses as fuel. In the first phases of commercial development, however, these problems will undoubtedly be influenced strongly by the growing demand for new sources of raw materials for chemicals.

H. S. TURNER
Director, Research & Development Div., Pittsburgh Consolidation Coal Co.

Matching supply to a doubled energy demand will present problems having the greatest influence on the gas, oil and coal industries during the next fifty years. Progress, measured by expansion is therefore assured, but in meeting this prodigious demand significant changes in the relative economics and uses of these fuels will occur. Wildcatting required on a vast scale, deeper wells, off-shore production, – all will add major costs to oil. This will confine this mobile fuel to its specialized but enormous role in our transportation system. Gas, "the perfect fuel," will inevitably command an appropriate price if an economic solution is to be found to the seasonal peaks implicit in its preferred use for home heating.

It is unlikely that these economic trends could be significantly altered by technical advance. However, coal only now is receiving benefits from the new machines and mining methods introduced in the last decade. Its vast resources and stabilized costs should make coal increasingly cheaper, relative to oil and gas. From this trend plus concurrent process improvements will evolve a major new industry in which coal is converted into gas and oil to help meet the demand for these naturally occurring fuels. As a step in this conversion, coal will assume a much greater role as a chemical source. Over-all, coal will regain a considerable portion of its historical percentage of the total energy supply and at the same time, shoulder vast new responsibilities in the processing field.

A. C. FIELDNER
Chief Fuels Technologist, Bureau of Mines

The most noteworthy change in the use of fuels in the last fifty years has been the shift in consumer preference from the solid to the liquid or the gaseous forms. Continuation of this trend will offer a serious challenge to the fuels industries that will greatly affect their progress.

Because known petroleum and natural-gas reserves are much more limited than coal resources, it is obvious that, within the early part of the next 50 years, difficult technical and economic problems must be solved in the production of synthetic gaseous and liquid fuels from oil shales and coal.

Outstanding among these are (1) the retorting of oil shale and the refining of oil and (2) the development of a simple process for direct production of synthetic gas from coal or lignite for the manufacture of liquid fuels and high Btu gas for long-distance pipeline transmission to supplement or replace natural gas.

Development of a cheaper process for producing oxygen will greatly improve the economics of synthetic fuel production.

Soap and Detergents Share Similar Problems

Both shoot for bigger markets,
hope for better and cheaper raw materials.

Soaps and detergents – among the oldest and the newest of the chemical process industries – have more in common than a slice of the same markets.

Both competitive and complementary, soaps and synthetic detergents face the same fundamental problems in the years ahead: How can we hold on to and expand the markets for our products? How can we get the raw materials we want at prices that will be stable and reasonable?

Lever's J. W. Bodman carries the soap industry's problem back to research: "The future progress of soap will be materially influenced by projected research developments which will place this commodity in a stronger competitive position to synthetic detergents."

And he goes on to forecast the probable trend of this research "... in the direction of eliminating or minimizing the natural reaction of soap with ordinary water hardness, particularly the calcium and magnesium salts ... improvement with respect to quickness of sudsing, detersive properties, its efficiency and mildness."

National Aniline's Lawence Flett feels that the problem of soap, probably the oldest important chemical made by man, "is one of continued modernization." In contrast, the detergents, "newest synthetic of the chemical industry," are made by complex chemical processes, modern engineering and in the finest of process equipment – yet they face the problems of expansion in a period of scarcity. Thus both industries, Flett continues, need equipment, but for different reasons.

"During the past five years," George Wrisley comments, synthetic detergents have revolutionized the packaged household soap business ... it is probable that the revolution will be a continuing one." The tremendous amount of research in the field, of course, is the basis of Mr. Wrisley's prediction. And the obvious sequel is another problem: Will synthetic detergents be able to revolutionize the toilet soap field, too?

Cost reduction is a matter of vital importance to the soap industry. Here the problem, as Mr. Bodman points out, is chiefly one of raw materials rather than process costs.

One of the major headaches of the soap manufacturers comes from the wide swings in the cost of raw materials, such as tallow and greases. Mr. Wrisley points out that these may vary up to 400 percent within a year's time; he emphasizes that "... even a partial solution of this cycle would be of great value to the industry."

Flett approaches the same problem from a slightly different angle. Says he: (1) soap and detergents must be cheap if they're to be widely used; (2) for this reason both products were originally made from byproducts – inedible tallow, kerosene, propylene, benzene; (3) but kerosene, propylene and benzene are no longer byproducts and inedible tallow will ultimately be in short supply; (4) hence the long-range outlook for raw materials is not a happy one:

"The soap industry needs new and synthetic fatty acids; the detergent industry must look to adequate installations to supply synthetic raw materials ..."

There is some competition between synthetic detergents and soaps, but Mr. Flett feels that continually improving standards of cleanliness and health will demand ever-increasing amounts of both. The detergents, he continues, are in need of new markets for further expansion and "... there is an urgent need for more marketing research, technical service and sales developments to promote detergents in the cleaning or wet processing fields ..."

Mr. Wrisley believes that both industries are at the mercy of the "rate of consumption," which in the U. S. is insufficient to take all that the industry can turn out. He feels, therefore, that Greater Cleanliness campaigns are particularly important to future growth. The Association of American Soap & Glycerine Producers recognizes this problem in its many cleanliness promotion activities.

Glycerine's future clearly hinges on greater price stability, better recovery technology and diversification in specialized markets. Only then can it hold its place among the polyols.

JOHN W. BODMAN,
Technical Advisor to the Board,
Lever Brothers Co.

LAWRENCE H. FLETT, *Director,*
New Products Division,
National Aniline Div.,
Allied Chemical & Dye Corp.

GEORGE A. WRISLEY,
General Manager
Allen B. Wrisley Co.

EXPLOSIVES NEED BASIC KNOWLEDGE

Why does sulphur so startlingly sensitize potassium chlorate? We really have no adequate explanation. To develop better explosives we need to know more about the nature of matter – molecular orientation and crystalline structure. We want to know more about detonation and the rates of detonation waves. Specifically, we must study the burning rates of military explosives, including control of delayed ignition systems; develop more powerful explosives, more stable propellants of higher energy and liquid propellants of high energy. We need continuous manufacturing processes to reduce quantities of explosive materials in process. We must promote safe practices by the users of our products.

FRED OLSEN, *Vice President, Research and Development, Olin Industries.*

The major problems facing the industrial explosives industry are the same as those facing all American industry. These are the difficult tasks of trying to produce at a profit, to improve and to expand under a cloud of controls and regulations and incentive-destroying taxes. The need is so great for new homes, highways and other construction, for steel and other heavy materials, and for the products of our mines that the demand for explosives should continue high.

H. F. BROWN, *Gen. Mgr., Explosives Dept., E. I. du Pont de Nemours & Co., Inc.*

FATS & OILS LOOK TO RESEARCH

Fundamental and applied research must be intensified to improve yield and efficiency of operations, improve quality and stability of existing products and find new products and new outlets. The important problems requiring further research are: (1) extraction processes; (2) continuous hydrogenation; (3) continuous refining and bleaching; (4) odor, flavor and color reversion. We should seek new and improved products for (1) pharmaceuticals and chemicals from sterols and other non-glyceride constituents; (2) new plastic coating materials from edible fatty acids such as acetostearins; (3) protective coatings for special purposes developed from combinations of fatty acids and other agents; (4) new glyceride products for special uses such as intravenous feeding, wetting agents and lubricants.

E. A. GASTROCK, *Head, Engineering and Development Div., Southern Regional Research Laboratory.*

CATALYSIS PROMISES MUCH

Most chemical engineers know that in synthesizing nitrates during World War I the perfected Bosch-Haber process made Germany independent of Chile saltpeter and therefore able to conduct a war despite the British navy. But few know that when the blockade shut Germany off from platinum, which was used in the catalytic oxidation of ammonia, it was Dr. Alwin Mittasch of Heidelberg, whose knowledge of catalysts led to the development of the substitute iron bismuth catalyst, who really kept Germany in the war. As our knowledge of catalysts and catalysis develops in the next half century, many syntheses of new and difficult products will become industrial realities.

JEROME ALEXANDER, *Consulting Chemical Engineer*

More Research, Better Furnaces for Electroprocesses

Sound research can offset rising power costs through better equipment and improved operations.

Power – large blocks of cheap, continuous power – is the lifeblood of the electrochemical and electrometallurgical industries. Where can we look for large, new blocks of cheap power? Dr. C. L. Mantell admits "... Canada might become the home of future electrochemical centers."

But research, which might well offset this geographical disadvantage, is inadequate, says O. W. Storey. He adds: "Although the electric power being consumed by the electroprocess industries is now 60 percent of the total industrial power load, knowledge of the fundamentals of the all-important electrode process is woefully small."

Storey points out that behind this research problem lies another one more basic: public relations, especially with the colleges. Electrochemistry, he adds, will remain a "forgotten subject" in our schools until the industry does a better job of interesting students and stimulating research.

Other problems that beset the electroprocess industries are politics (domestic and international), government interferences, high taxes, costly distribution and what Dr. Mantell calls "the Nationalism that ... interferes with the most economical production in one country and effective consumption in another."

Electrometallurgical industries have plenty of technical areas to tackle, says Marvin J. Udy: (1) electric furnace types and designs; (2) increase in kilowatt capacity; (3) more and better automatic controls; (4) better refractories; (5) better electrodes; (6) cheaper fuels for a major portion of the energy needs to get greater output from power contracts; (7) coordination of electric furnace and better use of chemistry and metallurgy; (8) air pollution.

For some non-ferrous metals, says John P. Hubbell in referring to zinc, "... the future belongs to those who can offer their major product in the purest form and convert the recovered impurities and waste products into dollar-producing byproducts."

Future of some of the newer metals – magnesium, calcium and titanium –"depends almost entirely on the development of more economical reduction methods" that will, in turn, open up bigger markets. So states Udy.

Mantell adds other problems in engineering development: (1) processes for plating all (he emphasizes this word) the metals and some non-metals as coatings or surfaces – thick or thin, dull, smooth or bright; (2) wider use of cyclic electrolytic oxidation and reduction processes so that power becomes a chemical equivalent; (3) higher powered cells and furnaces for fluorine, chlorine, magnesium, aluminum, alkali metals, carbide, ferro-alloys, titanium.

Much can be done in furnace design, Udy insists. Furnaces need to be designed with higher power factor to relieve the load from power companies and to make more efficient use of the available energy.

Furnaces designed to use 50-75 percent cheaper fuel w..l also make more power available. Then too, capacities can be raised to offset high labor costs. Even now, furnaces are being built for 30,000 kva., may very well go up to 60,000 kva.

Smaller units, Udy continues, can be developed to use cheaper fuel for up to 75 percent of the electrical energy; these would become competitive with larger units using all electrical power. The solution to this problem – which would open up many of our low grade or sub-marginal ores – seems in sight.

Improved furnace design and operation should also relieve refractory problems. Water-cooled and carbon-lined furnaces are coming more into use.

For the enterprising, Udy emphasizes that "the future of the electrometallurgical industry is just starting."

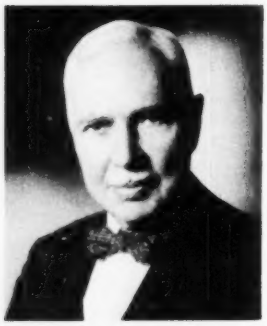
OLIVER W. STOREY,
Electrochemical Consultant.

MARVIN J. UDY,
Consulting Engineer.

CHARLES L. MANTELL,
Consulting Chemical Engineer.

JOHN P. HUBBELL, *Partner,*
Singmaster & Breyer.

Whither Chemical Engineering Education?



ALFRED H. WHITE
Prof. Emeritus of Chemical Engineering, University of Michigan

Continuing education is essential to the young chemical engineer who looks forward, hopefully, to perhaps 50 years of increasing service and responsibility in his chosen profession. His college training has given him only the foundation for his professional career. He must keep abreast of developments through study of technical journals and participation in professional societies. If he aspires to become an executive, he must acquire some knowledge of economics, sociology and psychology. To become a well-rounded citizen as well as a competent engineer, he will want to delve into many subjects he had to pass over in college – history, literature, music.

How can all this be accomplished? is asked me many times. There is no pat answer. Correspondence courses, local study groups, adult education programs – all are worthwhile and can be effective. But whether they are used and how depends on the individual engineer. All we who have traveled the road ourselves can say is that continuing education is an essential and rewarding experience.

W. H. McADAMS
Prof. of Chemical Engineering, Massachusetts Institute of Technology

Fundamental science, instead of empiricism, will be emphasized more in the future. Comprehensive case-type problems will give the student a better understanding of the interrelations of the various subjects in the undergraduate curriculum. Greater use will be made of numerical methods which permit realistic boundary conditions and give good answers by arithmetic, rather than continued acceptance of unrealistic boundaries to permit so-called exact analytical solutions. Where empiricism is necessary, to minimize experiments and broaden correlations, the principles of geometric, kinematic and dynamic similarity, and soundly chosen dimensionless moduli, will be used more widely.

In order to improve theories for the transfer operations (heat, mass and momentum) research will deal with determinations of mechanisms rather than evaluating arbitrarily defined rate coefficients.

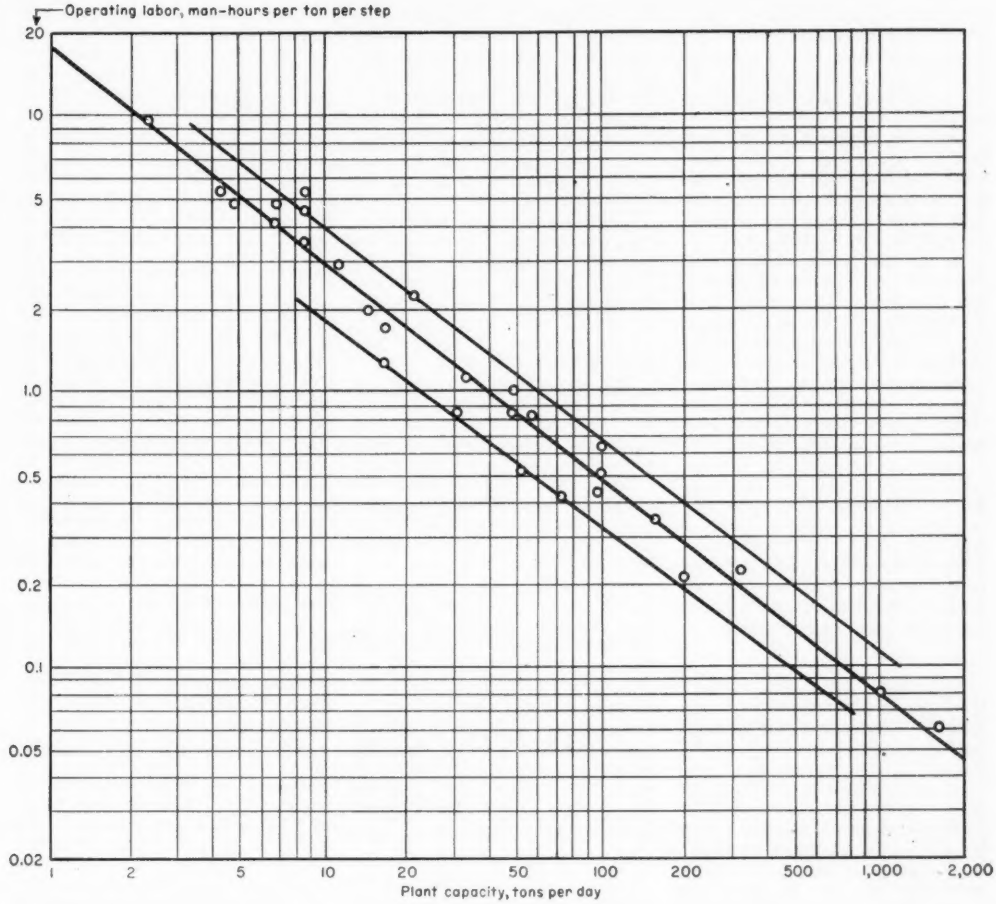
D. B. KEYES
Director and Consultant, Heyden Chemical Corp.

There is now a greater accent than ever before on the study of the basic principles of the physical sciences and their more fundamental application in the over-all field of chemical engineering. Research workers are steering away from the narrow field of the unit operations and are selecting, for study, some of the more fundamental problems involved in the applications of chemistry and physics in industry. Chemical engineering educators today are taking more and more interest in the broad fields of economics and human relations.

All this is encouraging. We now have a logical approach to the problem of training young men more effectively so that they may be more useful, not only as chemical engineers, but also in other important responsibilities in the process industries. But we have only started.

O. L. KOWALKE
Professor of Chemical Engineering, University of Wisconsin

The trend in modern industry is that more and more persons will be working as employees who must communicate with one another. Today, out of every 100 persons in the labor force in the United States, about 85 are employees. The number of self-employed persons and owners has decreased markedly in the past 50 years. Furthermore, the trend is toward a smaller number and to a larger size of establishments. In such circumstances, proficiency in the art of communication, both written and oral, is essential. A few research organizations now give their technical employees the opportunity to attend regular classes in report writing and public speaking. In our engineering colleges more stress must be laid on the need for making students competent to tell about a project in a logical, clear, concise, and exact manner. Communication is too often neglected as a unit operation in chemical engineering education.



New Graph Correlates Operating Labor Data for Chemical Processes

1. **Divide any process into its component steps and count the steps.**
2. **From the graph, find the labor per step at any desired capacity.**
3. **Multiply this factor by number of steps to get total man-hours.**

HENRY E. WESSEL

Engineers in the chemical process industries are interested in correlations which enable them to make quick estimates of processing costs for new production units or to evaluate the probable change in present costs as a result of equipment additions or process improvements. In the final analysis, the real aim of cost estimates, however much time they take or whatever their accuracy, is to make possible a calculation of the potential profit and return on investment for the project under consideration.

Chemical Engineering has published in recent years much information about the cost of process equipment, delivered and installed; this information has been received with enthusiasm by *CE* readers. In addi-

H. E. Wessel *is an ex-Monsantoan now with the Midwest Research Institute in Kansas City, where he conducts technological, market and economic studies.*

tion, to permit adjustment of equipment costs from a known value for a definite size unit to an estimated value for a larger or smaller unit, the "six-tenths factor" was thoroughly examined.

Operating labor costs are an important part of the total cost of production. Operating labor as a percentage of total production costs varies from 3 to upwards of 30 percent, averaging about 10 percent for many cases.

In addition, many other production costs are frequently estimated as a percentage of operating labor. These include supervision, social security, pensions and other employee benefits, clothing and laundry. Indirect overhead expense, such as plant office, personnel and other service departments, is often charged as a percentage of operating labor costs.

Preliminary calculations of potential profit and return on invested capital are frequently based upon sales volumes and prices which are not pinpointed to even 5 or 10 percent accuracy in the early stages of economic evaluation of a new plan. Extreme accuracy in estimation of operating labor costs may not be required.

NEW GRAPHICAL CORRELATION

Approximate labor costs in man-hours per ton of product were published by Chilton in *Chemical Engineering*, Feb. 1951, p. 151. With this information, and an estimate of typical plant sizes from the literature and from "Industrial Chemicals" by Faith, Keyes and Clark, the author has derived the accompanying graphical correlation of operating labor in man-hours per ton per processing step vs. the size of the plant in tons of product per day, without regard to the particular process.

Plant sizes in this correlation range from 2 to 1,500 tons per day. The processes studied involve batch, continuous, and mixed operations in tonnage organics and inorganics, intermediates, and low-volume organics, most of them indicated by Chilton.

Inherent accuracy of this correlation is evident from the spread of the points and depends a great deal upon the number of steps in the process concerned. Results were found to check reasonably well with the author's cost estimates for specific processes. Values of man-hours per ton at various production levels as derived from the chart are multiplied by average hourly wage rates to get estimated operating labor costs.

Here's how the points on the chart were obtained: For example, the process for acetic acid from carbide involves six steps—acetylene generation, hydration to acetaldehyde, absorption of acetaldehyde, distillation, oxidation to acetic acid, and distillation of the acid. According to Chilton, about 28 total man-hours are required for a typical plant. Size of a typical plant, according to the literature, is about 7 tons per day. The value for man-hours per ton per step is, therefore, about 4.5.

As another example, ethanol from molasses requires five steps—yeast preparation, fermentation, beer distillation, aldehyde distillation, and final rectification. About 3 man-hours per ton are indicated, giving a value of 0.6 man-hours per ton per step for a 100-ton-per-day plant.

Still another example would be sodium dichromate from chromite ore. Here nine steps are indicated—milling, mixing, roasting, leaching, filtration, evaporation, crystallization, centrifuging, and drying. About 15 man-hours per ton total operating labor is indicated, or about 1.7 per ton per step. This is for a 16-ton-per-day plant.

Undoubtedly, some differences of opinion could arise about the division of various processes into steps and as to the size of typical plants. The intent of this work, however, was to derive a general correlation of better than order-of-magnitude accuracy. Using caution as to the accuracy of estimate derived from the chart and the accuracy required for the job at hand, the engineer faced with the need to make a quick estimate should find this correlation of help.

HOW TO USE THE CHART

Let's take a few examples as to the use of the chart. Suppose we want to estimate the total operating labor required for a 15-ton-per-day sodium chlorate plant. About four steps are involved—electrolysis, evaporation and filtration, crystallization, and centrifuging and drying. About 2 man-hours per ton per step are required, or 8 man-hours per ton total.

For soap glycerine, seven steps are involved—precipitation, salting evaporation, salt recovery, foot distillation, sweet water evaporation, char treatment, and final filtration. A 100-ton-per-day plant requires 0.5 man-hours per ton per step, or a total of 3.5 man-hours per ton. A figure of 0.7 man-hours per ton per step, taken from the upper curve, yields a total operating labor of 4.9 man-hours per ton, bracketing Chilton's value of 4.0.

Still another example would be nitrobenzene, where three steps are indicated—nitration, spent acid recovery and fortification, and washing and distillation. The chart indicates that an average 30-ton-per-day plant requires about 1 man-hour per ton per step, or a total of 3 man-hours per ton. *Chemical Engineering Flowsheets* indicates the labor cost to be 2.4 percent of the total manufacturing cost, which would amount to about 2 man-hours per ton. Faith *et al* indicate that the ratio of labor cost to raw material cost is very low for this process, but probably today it does actually run higher than 2.4 percent.

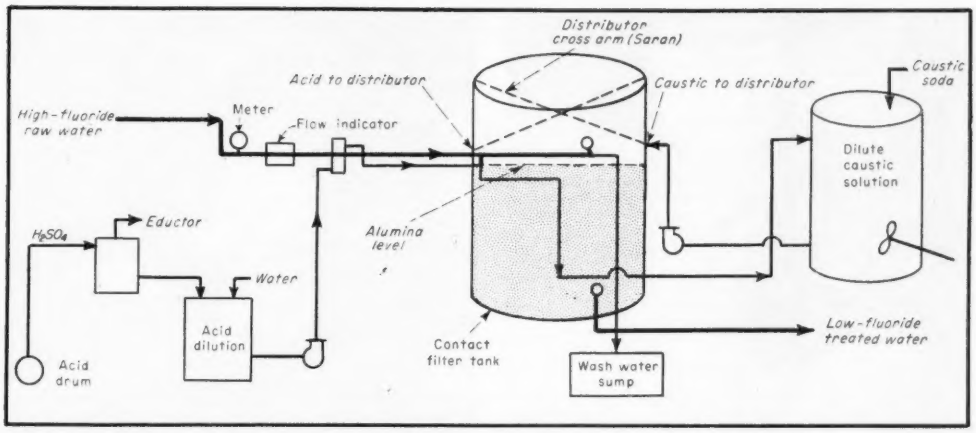
SIGNIFICANCE OF CORRELATION

Some generalization about the variation of operating labor costs with the size of the plant might be deduced from the graph, analogous to the "six-tenths rule" for equipment and plant costs. Suppose we assume that a process could be converted from batch to continuous at the economic point and that adequate instrumentation and larger units of equipment would be supplied. It could then be argued that the size of the operating labor force would remain substantially constant as the size of the plant increased and consist of one operator and helper per step per shift. As a practical matter, however, the labor force increases with the size of the plant because of the increasing complexity of instrumentation and machinery and because of labor policies.

The chart shows three separate lines. The middle line combines both batch and continuous operations and assumes that conversion from batch to continuous has occurred at the economic point in the process as the volume of production is increased. The upper line might be explained on the basis that some processes reach large-scale production by merely duplicating smaller units, without developing correspondingly large reactors and adequate instrumentation. Or these processes may retain certain high-labor-cost batchwise operations.

A recent article, "What Price Tonnage Oxygen?", *Chemical Engineering*, July 1951, p. 186, indicates that the operating force for a tonnage oxygen plant would remain about constant over a range of 25 to 500 tons per day capacity. In this connection, the lower line on the chart is for such processes involving extra large processing units, or gases or liquids only, with a high degree of instrumentation.

The graph might be used to compare costs for existing operations in a step-by-step fashion with the average, at least where the variation from the average is quite large. The order-of-magnitude margin available to finance labor-saving improvements will then be indicated.



NEW system contacts raw water with alumina to remove fluorides, re-activates alumina by alkali and acid washes.

Cheap Way to Remove Fluorides from Water

If your water supply has too much fluorides you can now take them out with this new and simple setup. A 450-gpm. unit costs only $10,000 but cuts fluorides from 8 ppm. to 1 ppm.

JAMES A. LEE

Real progress is now being made in the removal of damaging amounts of fluorides from public water supplies.

In March of this year a new plant was put in operation at Bartlett, Texas, in which the fluorine content of the raw water is being reduced from 8 ppm. to 1 ppm. equivalent in delivered water. Removal is done in an open, contact installation. This is the first time the process has been used.

An earlier attempt to remove fluorides made use of a pressure-contact system at Britton, S. D., in 1949. In both locations fluorosis (mottling of the teeth) shows up in people who have continuously used these waters.

To remedy this health hazard the U. S. Public Health Service initiated the projects in cooperation with the municipal officials. Both were financed in equal portions by the municipality and the government agency.

While the pressure-contact system is still operating successfully it is believed that the open, contact installation using a different sorbent has some advantages. Among these is the fact that processing can be closely observed and controlled. Another is its lower operating and equipment costs.

James A. Lee, our Southwest editor located in Houston, took a trip to Bartlett to get the first-hand facts on this new installation.

The Bartlett plant was built to show that fluorides can be taken out of water supplies by simple low-cost processing. The system consists of a contact filter tank, filter media, regenerating and neutralizing equipment.

Complete ion removal could be used to reduce fluorides; actually, this process would not be practical because much of the water is used for spraying the lawn, washing and other household purposes where other mineral constituents are not objectionable.

The problem, therefore, is to find a sorption media that will reduce essentially only the fluorides. While the synthetic hydroxy apatite used at Britton gave satisfactory results, the activated alumina in use at Bartlett does have advantages.

REMOVES THE FLUORIDES

Fluoride-laden water from two 1,000 ft. wells is pumped to the plant, metered, and passed through the contact tank. Treated effluent is discharged directly to the 300,000-gal. underground storage tanks in the distribution system. Pumps on these tanks maintain consumer pressure and supply when the plant is not operating. Pressure controlled switches actuate the deep well pumps.

Raw water passes downward by gravity, at the rate of 450 gpm., through the contact filter—an open vertical, cylindrical, Heresite-lined steel tank. This tank is filled to within four feet of the top with activated alumina that absorbs or adsorbs fluorides. The exact nature of the sorption is not known. There are 500 cu. ft. of 28 to 48 mesh alumina. The bed is supported on 12-in. of gravel of three grades. Under-drainage is through 0.25-in. umbrella strainers on a pipe grid.

During the passage of the raw water through the activated alumina the pH of the water remains constant. Considerable hydrogen sulphide bubbles up and escapes into the atmosphere. Whether or not the sorption media significantly affects other constituents of the raw water has not yet been determined.

Treated water to the consumer distributing system contains 1.0 ppm. fluoride.

At present the plant is operating on an 8-day cycle; it is expected that eventually it will be on a 7-day cycle, although the length will vary with the season of the year and local conditions. The plant is now operated about 10 hours per day.

RE-ACTIVATES THE ALUMINA

At the end of the cycle activated alumina is regenerated in two hours. This is done by (1) backwashing to

(*Continued on page 400*)

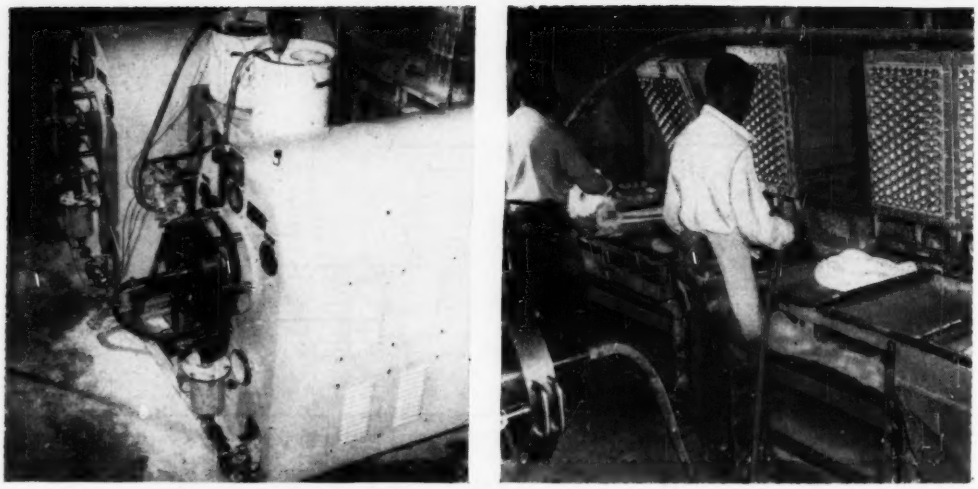


Fig. 1—At left are the two AMF Oakes continuous mixers which produce foamed latex shown at the right being charged into molds in the plant of American Foam Rubber Corp., at Burlington, N. J.

How Low-Density Solids Are Made

Foamed and cellular products made from rubber, plastics, glass, regenerated cellulose and even concrete are becoming big business in many different fields. Here are the principal ways they are made.

JOHN A. ABBOTT

For many years the interest of chemical engineers in foams has been mainly a negative one—devising methods of preventing foam. Now, however, a whole new class of products is coming on the market, depending for their usefulness on the fact that they are stabilized foams. In general these are low-density solids containing a high volume percentage of gas in any desired range of bubble size. They include products for applications requiring low heat or sound conductivity, high buoyancy, absorptivity, resiliency, or high strength-to-weight ratio.

Cellular rubber products are used for automotive seat cushions, mattresses and shoe innersoles. Plasticized foamed vinyls are used for U. S. Navy life rafts. Foamed phenolic resins are effective thermal insulators. Foamed cellulose plastic and foamed vinyl resins are used to make synthetic sponges. Slabs of polystyrene are installed in boat hulls for buoyancy. Foamed glass insulation is efficient and inert to chemicals and temperature extremes. Concrete and wall board materials are extended by dispersing air in the wet mix. Foamed plastic materials are used to fill aircraft structural members for strength.

The increase in the number of foamed products and the existing incentives for their production indicate that the industry will continue to grow. Irrespective of the material, the low-density solids divide structurally into two classes: those with interconnecting cells like a sea sponge, and those with non-connecting cells. The method of manufacture determines the structure, and structure may affect the end use:

For instance, foam rubber (which has connecting cells) can be used where the material must breathe. But sponge rubber (which has closed cells) would not be useful in this application.

With one or two notable exceptions, the manufacturing processes fall into three classes, as shown in the accompanying table. These include (*A*) the whipped foam process; (*B*) the chemical blowing process; and (*C*) blowing by expansion of previously dissolved gas or liquid.

Process *A* gives interconnecting cell structure; *B* and *C* usually give non-connecting cells but may sometimes be modified to give interconnecting cells.

Rigidity, specific gravity, and cell uniformity and size in the finished product are variable in all processes.

All three processes involve dispersion of a gas in a liquid phase, followed by curing (solidification) of the liquid phase to form the porous solid. The processes differ in the method of forming the gas dispersion, as well as in the curing of the liquid foam.

In producing new foamed products for new uses it is frequently possible to use existing techniques and apparatus as described in the table. The choice of method depends on the nature of the raw materials as well as the end use of the product and the economics of its manufacture.

J. A. ABBOTT *is a chemical engineer, in the Continuous Mixing Division of American Machine & Foundry Co., New York. Being interested in one phase of foamed product manufacture, he decided to survey the other principal phases. This article, unique in the literature, is the result.*

FOAM WHIPPING PROCESS

The most common industrial application of this process is in the manufacture of foam rubber from latex. The processing steps are illustrated here by the foam rubber process, but they apply also in the manufacture of vinyl plastic sponges and inorganic soundproofing board.

1. Compounding of natural or synthetic latices with vulcanizing agents and a foaming agent.
2. Dispersion of air by whipping in a frothing apparatus.
3. Dispersion of gelling agent in the foam in the final stage of the frothing cycle.
4. Introduction of foam into molds.
5. Gelling of the foam.
6. Curing of the foam in the molds by heat.
7. Removal of the foam rubber product from the molds.
8. Washing and drying of the product.

In the widely used Dunlop process for foam rubber, the gelling agent is a water dispersion of a slightly soluble acid salt, sodium silicofluoride. After it is dispersed in the latex foam, the salt hydrolyzes over a period of minutes to lower the pH of the alkaline latex. Sufficient gel slurry is used to cause gelling, by precipitating the rubber from dispersion, in 3 to 7 min. Thus the gel point is delayed until the foam is out of the mixer and deposited in the molds.

The gelling or stabilizing action in the foam whipping process for latex and other compounds may be much slower than that just described. Particularly, if latex foam is cast in a thin sheet (high area-to-volume ratio), the gelling agent may be slower to act, and may be active only when heated. Fast heat penetration of the thin slab causes stabilization.

In the preparation of fireproof sound-insulating board, a slurry of finely ground inorganic materials in water is whipped into foam, poured into the molds, and allowed to stand for several hours. Foam stabilization eventually occurs by reaction of some of the water with one or more of the inorganic ingredients. Surplus water evaporates and a dry board of foam remains, having an interconnecting cell structure—the preferred structure for sound insulation. After removal from the molds the board is cut to size.

The whipping process is used in the production of a synthetic vinyl resin sponge where quick chemical stabilization of the foam is possible. However, there is no general use of this process for foam plastic production with vinyl chloride plastisols. It is understood that one reason for this is the difficulty in stabilizing the foam so it can be cured without breakdown. Considerable effort is being put forth to develop a whipping process for foamed plastics.

Methods and Equipment for Foamed Products Manufacture

Method	Process	Apparatus for Foam Generation	Typical Products
I. Formation of gas dispersion in liquid phase, followed by curing in liquid phase.	A. Whipping process; subdivision of gas in liquid by agitation.	1. Batch mixers with wire whips. 2. Continuous flow mixers.	Foam rubber Vinyl plastic sponges Sound insulating board Soluble gelatine surgical sponges
	B. Chemical blowing by generation of gas bubbles in the liquid.	Heated molds, closed, or expansible, or open.	Sponge rubber Foam rubber Foam glass Most foamed plastics
	C. Blowing by expansion of previously dispersed inert gas.	1. Closed, agitated bomb or reactor with throttling discharge valve. 2. Continuous mixer.	Foamed polystyrene plastic Foamed vinyl plastic
II. Methods in which dispersed phase is not a gas initially.	Dispersion of salt crystals, which are leached out during coagulation of the liquid phase.	(Specialized equipment, no general classification)	Cellulose sponges Cellulose sponge yarn

The food industry was the first to employ the whipped foam process extensively, and much of the foam whipping technique in industrial processes is similar to that used in the preparation of several commercial whipped foam food products.

For example, marshmallow and commercial meringue topping are whipped foams which usually are stabilized on cooling by the gelling action of gelatin or a synthetic gum. Angel-food cake batter is stabilized in the oven by the coagulation of egg albumin. In one process for producing powdered egg-whites, the whites are foamed and dried in a band oven. Whipped butter, which contains 50 percent air by volume, has sufficient viscosity for stability without added agents.

WHIPPING EQUIPMENT

Equipment as well as technique for industrial whipped foam processes was borrowed directly from the food industries.

Batch mixers of the vertical, planetary bakers' type have been used extensively in the production of foam rubber from latex. A multiple wire whip revolves in the mixing bowl, and describes a planetary action around the inside of the bowl. This action, and the conformance of the wire whip to bowl contour, gives good agitation at all points in the bowl. During the first part of the latex frothing cycle the whip folds air into the compounded latex and subdivides the bubbles. To achieve finer cell structure, the whipping stage may be finished by turning the whip slowly to further subdivide coarse bubbles formed near the end. In other cases, finer cell size is produced by introduction of the air through a fine sparger plate in the bottom of the bowl. Near the end of the cycle the gel ingredient is added.

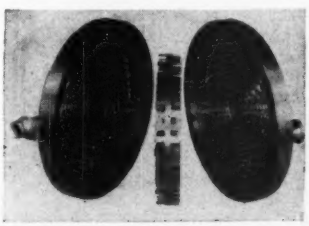


Fig. 2—Two stator halves and the rotor of an AMF Oakes mixer, disassembled to show the intermeshing concentric teeth

Mixers of this type are available in capacities of more than 50 lb. foam latex, whipped to pillow density. One model provides infinitely variable whip rotation speeds, and two different planetary speeds to allow elimination of swirl without baffles. At a ratio of rotary rpm. to planetary rpm. of 2:1, swirl in the early mixing stage is eliminated as effectively as with baffles. The mixing cycle is finished at the 4:1 ratio except for the gel dispersing stage, during which the planetary action is stopped and the deep vortex generated by the rotary motion alone is used to draw in the gel slurry.

This batch equipment is particularly advantageous in (1) small and medium size plants, (2) for use with non-pumpable mixes, like those containing coarse inorganic materials, glass fiber reenforcement, etc., (3) in cases where slightly non-uniform cell structure is desired (synthetic sponge), and (4) where there is more than one type of product to be mixed.

For large-scale manufacturing, continuous flow frothing equipment is preferable from a production cost standpoint and gives some specific advantages in product quality. In some

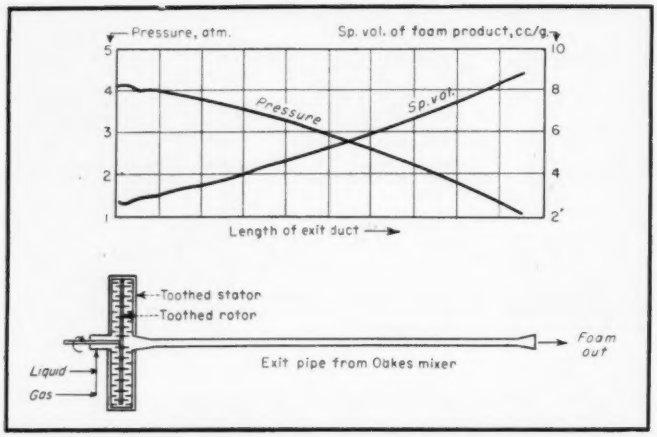


Fig. 3—Curves show how pressure falls and product expands in the outlet pipe of an AMF Oakes continuous mixer operated at 4 atm.

cases continuous operation of batch planetary mixers has been effected by pumping compounded base liquid into the bottom of the bowl and allowing the foam to overflow. This introduced some of the economy of the continuous process although it was complicated by the necessity of adding the gelling agent (particularly the quick-acting variety) in a subsequent mixer, with lower residence time.

One patent (U.S.P. 2,574,220) has recently suggested use of a series of batch mixers, each successive mixer larger than the preceding one, and arranged so that material progresses from mixer to mixer as more air is incorporated.

CONTINUOUS FOAM MIXERS

Since 1946 continuous flow foaming equipment has been in use which demonstrates advantages over batch methods. These continuous whipping devices employ a completely closed system, positive metering of liquid and gas streams, a small zone of intense agitation, operation under pressures above atmospheric, and closely controlled, easily adjustable operating conditions. Intensity of agitation, rate of throughput, and specific gravity are all controllable.

The mixing process is under positive pressure, so that the finished foam may be delivered with a nozzle to an open mold, or may be injected into a closed mold to save materials and doctor knife labor.

Savings in batch weighing, cleaning, materials, floor space and labor are inherent in this continuous process as in other continuous flow processing operations. The continuous process also allows a wider range of product characteristics, while pressurized operation makes lower specific gravities possible and allows some liquid compounds to be foamed which are not foamable in open batch type equipment.

All inert gas bubbles introduced to the liquid initially are subject to the same degree of mixing and subdivision, therefore small, uniform cell size is obtained. Foam products produced in the closed continuous process tend to have greater stability as a result of small cell size. For a given specific gravity a decrease in cell diameter requires a larger total area of cell wall, hence a thinner wall. There is therefore less tendency toward "weeping" of the cell walls and subsequent foam breakdown. Frequently the concentration of stabilizer may be reduced in continuously foamed products.

The foaming apparatus of two commercial units, the AMF Oakes mixer and the Marco foam generator, are shown in Figs. 1 and 4.

The mixing chamber of the standard AMF Oakes mixer (see Fig. 2) has a net volume of approximately 1 gal., hence residence time for a light foam is low. Latex foam of "pillow density" (specific gravity of wet foam 0.08) produced at 1,000 lb. of wet latex per hr. would pass through the mixing head in approximately 12 sec. The inherently high purging efficiency allows a considerable degree of freedom in adjustment of gel times without danger of gelling material in the mixing head.

The single rotating member is a stainless steel disk with evenly spaced concentric ribs on either side which are divided into teeth. The cylindrical shell of the mixing head is stationary, and each half has concentric rings of teeth which fit between the rings on the rotor. There are no rubbing parts in the mixing head. Liquid feed material enters the mixing head centrally at the back and passes radially out between the rotor and stator members, around the edge of the rotor, and back to the front center to exit. In making this circuit the large bubbles of gas are divided repeatedly by passing through the meshed-tooth structure. The gelling ingredients for foam rubber are metered continuously into the mixing head through the back stator member.

For foaming different products a choice of mixing heads is available with different radial and axial clearances between teeth. The rotor speed is infinitely variable between limits to give the desired intensity of mixing action. Liquid feed material is metered with a positive displacement pump, and the air rate is controlled through a rotameter to give the desired wet foam specific gravity.

The operating pressure in the mixing head is an important variable in the production of foam with the AMF Oakes mixer. Lighter foams and higher production rates are obtainable at working pressures of 3 to 6 atm., than at atmospheric pressure. As shown in Fig. 3, when the pressure in the mixing head is maintained at 4 atm., the volume of the required amount of inert gas in the head is only one-quarter of that in the finished foam. Thus, volumetrically, the mixer disperses only one-quarter the gas that an open mixer must disperse, and the liquid-gas mixture in the head is subject to the mixing action longer. For a finished foam containing one part of liquid to eight parts of gas by volume at atmospheric conditions, the mixing head actually contains a 1:2 mixture by volume.

With most foamed products it is preferable to maintain pressure on the mixing head by the resistance to flow in the exit line. If a throttling valve is used, the abrupt change in pressure as the foam is forced through the valve is destructive to the foam. However, gradual release of pressure as the foam flows through an extended exit duct allows individual gas cells to expand slowly without rupture.

Operating pressure is a function of production rate, foam viscosity and specific gravity, and the length and cross-sectional area of the exit duct. For a given operating rate and product specific gravity, the pressure is determined by exit duct dimensions. Pressure may be fixed by choosing hose or pipe line of the proper size and

length, or by the use of a special device in the exit line. With this device, the mixing head discharges into the mid-section of a cylindrical shell containing a spiral screw. The screw position in the shell is variable longitudinally to allow the foam to pass through the proper fraction of the total spiral path between screw and shell, and thus build up the desired pressure. As a modification, the cross-sectional area of the spiral path may be made variable, instead of the length.

The Marco continuous foam generator, as used in the foam latex process, is shown in Fig. 4. The unit has two foaming chambers in series, followed by a blender for dispersing the gelling ingredient. Pumping and metering of all fluid streams including latex, air, activators and gelling ingredient slurries, are accomplished with Marco rotary positive displacement pumps, driven by variable-speed mechanisms to permit maximum flexibility in operating conditions.

The liquid latex supply pump meters from a tank to the suction side of the air-latex pump at a rate less than the volumetric capacity of the air-latex pump, so that air is drawn into the system through the open end of a tee in the pipe line connecting the two pumps. The two pump rates are adjusted to give the correct proportion of air to latex for the desired specific gravity in the finished foam.

The air-latex metering pump (which also acts as an air compressor) propels the mixture through the system, beginning with the upper foam generator. Each foam generator is divided by baffles into four compartments in series, equipped with folding type beaters, so that the individual air cells are progressively subdivided in passing through eight successive compartments.

The foam chambers and beater shaft seals are water cooled. A slurry of activating agents is metered in and dispersed near the exit point of the second foam generator. The foamed mixture is piped into the blender unit, where the gel slurry is metered in and dispersed in the foam.

In commercial practice two blending units are mounted in parallel for alternate use to allow uninterrupted production. To switch blenders the operator turns a control valve which cuts out the blender in use, cuts in the alternate blender and switches over foam and gel slurry streams. This feature extends maximum operating periods, which vary depending on compound formulation and the nature of the gel ingredient.

It is understood that the design of the Marco latex pumps, particularly the water cooling system, allows operation for weeks before dissembling for cleaning. As with foam generator beater shafts, each pump rotor shaft seal consists of two O-ring gaskets. Cooling water flows between the two gaskets to dissipate heat. Rotor seal plates also may be water cooled if desired.

CHEMICAL BLOWING PROCESS

Sponge rubber, heavier and firmer than foam rubber, is produced by chemical blowing. Heat sensitive agents which yield CO_2, nitrogen or ammonia are milled with rubber paste and other compounding agents. Typical blowing agents are sodium bicarbonate, ammonium bicarbonate, Naugatuck Celogen and DuPont Unicel. The paste is cured in closed molds by heat and pressure to cause blowing by gas generation. Lowest practical specific gravities of rubber products with this method are much higher than for foam rubber. However, the chemical blowing process is used for foam rubber manufacture in the Tallalay process (Sponge Rubber Products Co.) to produce a very uniform closed cell structure of low density.

Most of the foamed plastic products on the market are produced by the chemical blowing process. This process usually gives a closed cell structure, particularly when the resin expands in closed molds under pressure. However, in some cases, when expansion is free (or in an expansible mold), an interconnecting, or partially interconnecting structure is obtained.

In a Sponge Rubber Products Co. method for expanded polyvinyl chloride (Sponge Plastic) a plastisol is ground with a blowing agent, poured into a mold, and heated. The plastisol fuses under heat and the blowing agent decomposes to liberate nitrogen. The cell structure is normally nonconnecting. In a closed, low-pressure mold, ten "blow-ups" are attained.

In addition to the thermoplastic vinyl chloride resin foams, thermosetting resins such as the phenolics, urea formaldehyde, and Shell's new Epon resin are foamed by the chemical blowing process.

Rezolin's Corfoam 114 and Bakelite's foamed phenolic are examples. The latter produces a foamed product with a specific gravity as low as 0.005. Liquid resin is whipped with air to provide fine nuclei as seeding for the blowing operation, then is mixed quickly with the necessary activators and poured into the mold. The time interval between the addition of the activators and rapid expansion of the foam in the mold is as low as 5 to 7 sec. The chemical reaction is violently exothermic and the principal blowing agent is water vapor. To prevent collapse of the foam after formation, due to heat loss and consequent condensation of steam before the plastic hardens, it is necessary to blow the plastic in large batches which give a minimum ratio of surface area to volume in the finished foam. In commercial practice a cube of foam is formed, 4

(*Continued on page 401*)

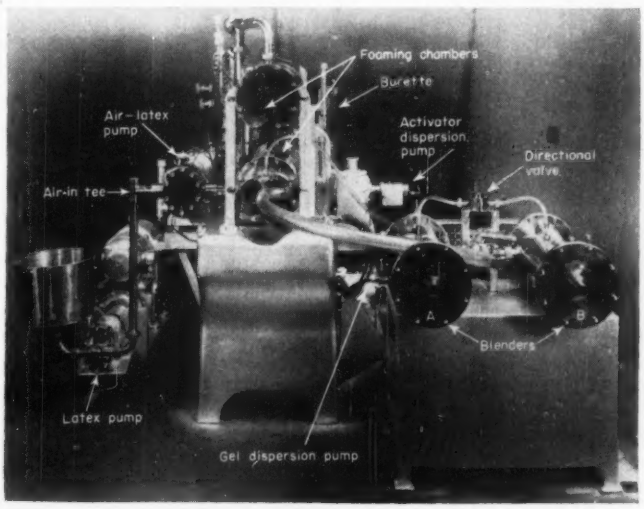


Fig. 4—Marco continuous foam generator showing foaming chamber, pumps and blending units, as used in making foamed latex.

NOMOGRAPH For Combustion Control

J. F. VOORWIJK

When carrying out flue gas control it is important to know both the maximum CO_2 content of the flue gas and the percentage of excess air.

Maximum CO_2 content which is obtained when using the theoretical minimum quantity of air can be calculated from the composition of the fuel. But for this purpose it is necessary to know the molecular composition of the fuel, for which an elementary analysis would be required.

Maximum CO_2 content and the percentage of excess air, however, can be readily computed from a flue-gas analysis, without requiring a fuel analysis, provided the fuel contains no nitrogen.*

Although the examples below might be sufficient to illustrate use of the nomograph, a more detailed explanation follows.

The formulas by which the maximum CO_2 and the percent excess air, e, can be computed are:

$$\text{max. \% } CO_2 = \frac{21 \times (CO_2 + CO)}{21 - (O_2 - 0.395 \times CO)} \qquad (1)$$

$$e = \frac{79 \times (O_2 - \tfrac{1}{2}\,CO) \times 100}{2100 - 21\,CO_2 - 100\,O_2 + 18.5\,CO} \qquad (2a)$$

(e = percent excess air)

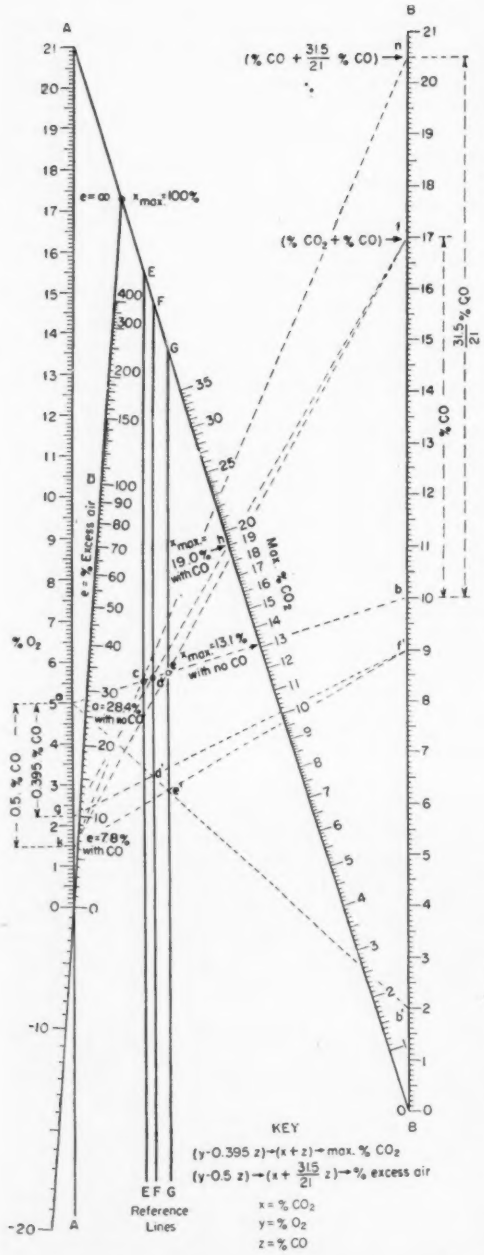
$$\frac{(O_2 - \tfrac{1}{2}\,CO)}{100 - (CO_2 + CO \times 31.5/21)} = \frac{21 \times e}{100 \times (e + 79)} \qquad (2b)$$

The nomograph consists of a % O_2 scale A and a % CO_2 scale *B*.

Two inclined scales *C* and *D* indicate the maximum percent CO_2 and the percent excess air, respectively.

In addition, there are three reference lines:

Line *E* is used for the determination of the percent excess air when CO is present in the flue gas. It is the locus of all centers of projection by means of which a line segment on the % O_2 scale representing 0.5 × % CO is projected in such a way upon the % CO_2 scale that we get a line segment representing % CO × 31.5/21. Thus when $ak = 0.5 \times \%\ CO$, $bn = \%\ CO \times 31.5/21$. *c* is the center of projection.



COMBUSTION CALCULATIONS involving nitrogen-free fuels are expedited with this nomograph. Illustrative examples in the text are worked out on the chart above.

* As regards the flue-gas analysis it should be remarked that: (1) The CO_2, CO and O_2 percentages refer to dry flue gas. (2) Since the conventional CO_2 analysis with KOH gives the sum of the % CO_2 and the % SO_2, assuming that the sulphur burns completely to SO_2, the percent of excess air is always correct whatever might be the sulphur content of the fuel. The actual max. % CO_2, however, would in fact be smaller than the value determined by the nomograph. If an absolutely accurate max. % CO_2 figure should be essential, a laborious and precise fuel analysis would be required. This has been avoided by starting from the flue-gas analysis.

J. F. VOORWIJK *is on the staff of N. V. De Bataafsche Petroleum Maatschappij, The Hague, which is associated with Shell Development Co.*

• Chart can help you find maximum percent CO_2 and percent excess air with either complete or incomplete combustion of fuel.

• Quick answers can be found using flue gas analysis from any standard apparatus.

The reference line *F* is the locus of all centers of projection by means of which a line segment on the % CO_2 scale representing % CO is projected in such a way upon the % O_2 scale that we get a line segment representing 0.395 × % CO. Thus when $fb = f'b' =$ % CO, we have $ag = 0.395 \times$ % CO; *d* and *d'*, respectively, are the centers of projection.

The reference line *G* is the locus of all centers of projection by means of which a line segment on the % CO_2 scale representing % CO is projected in such a way upon the % O_2 scale that we get a line segment representing 0.5 × % CO. Thus when $bf = b'f' = 0.5 \times$ % CO; *e* and *e'*, respectively, are the centers of projection.

It should be stressed that ($O_2 - \frac{1}{2}$ CO), ($CO_2 + CO \times 31.5/21$) and ($O_2 - 0.395 \times$ CO), occurring in the Eqs. (1) and (2b), need not be computed at all when using the reference lines *E*, *F* and *G* in the right way. ($CO_2 + CO$), however, can be readily computed mentally.

It is important to notice that Eq. (2a))can be written as Eq. (2b), which explains the procedure as has been outlined.

The nomograph can also be used as verification of the accuracy of the analysis of the flue gas, when the maximum CO_2 content has been calculated from the composition of the fuel. If this number does not agree with the maximum CO_2 content calculated from the analysis of the flue gas, the flue-gas analysis may be questioned.

EXAMPLE 1

Given: 10% CO_2, 5% O_2 0% CO.
Find: Max. CO_2 and % excess air.

Connect the %O_2 on the *A* scale (point a) to the %CO_2 on the *B* scale (point *b*). Line *ab* cuts the *C* scale at 13.1 and the *D* scale at 28.4 giving the values for max. % CO_2 and the percent excess air respectively.

EXAMPLE 2

Given: 10% CO_2, 5% O_2, 7%CO.
Find: Max. CO_2 and % excess air.

Connect the % O_2 on the *A* scale, (point a), to the % CO_2 on the *B* scale, (point *b*), to locate the points c, *d* and e respectively on the reference lines, *E*, *F* and *G*. Add the 7% CO to the 10% CO_2, giving 17 (point *f* on the B scale). The line *fd* cuts the scale *C* at *h*, the desired value of max. % CO_2: 19.0. When *fd* is made to cut the *A* scale at a point g, notice that $ag =$ %CO × 0.395. This quantity must be subtracted from the % O_2.* In order to find the % excess air, subtract 0.5 times % CO (i.e., 3.5) from the % O_2, giving 1.5 (point k) on the *A* scale. The line *ck* cuts the scale *D* at the desired value of the % excess air, e = 7.8. When *kc* is made to cut the *B* scale at a point *n*, it should be noticed that $bn =$ % CO × 31.5/21. This quantity must be added to the % CO_2.* When *fe* is made to cut the *A* scale at a point *k*, it should be noticed that $ak = 0.5 \times$ % CO. As we have seen, this quantity must be subtracted from the % O_2.*

EXAMPLE 3

Given: 7% CO, 10% CO_2, 19% max. CO_2.
Find: % O_2 and % excess air.

It could be assumed that the max. % CO_2 for a certain fuel is a pre-fixed number. We add mentally the % CO to the % CO_2 giving 17 (point *f* on the *B* scale). Align this point with the max. % CO_2 (point *h* on the C scale), cutting the reference line *F* at the point *d*. Align this point with the % CO_2 (point *b* on the *C* scale), cutting the scale A at the graduation giving the desired value of 5% O_2 (point a).

In order to find the % excess air we have to locate the points of intersection of *db* with the reference lines *E* and *G*. These are c and e respectively. If *fe* is made to cut the A scale and this point of intersection, *k*, is joined to c, the line *kc* cuts the scale *D* at a point giving the desired value of 7.8% excess air.

EXAMPLE 4

Given: 5% O_2, 10% CO_2, 19% max. CO_2.
Find: % CO and % excess air.

Again it can be assumed that the max. % CO_2 for a certain fuel is a pre-fixed number. If the line joining the % O_2 (point a on the A scale) to the % CO_2 (point *b* on the *B* scale), is made to cut the reference line *F* and this point of intersection d is joined to the max. % CO_2, (point *h* on the C scale), this line *hd* cuts the scale *B* at the point giving the value of 17 for (% CO_2 + % CO) at point *f* on the B scale. Since the % CO_2 is known, the % CO can then be readily computed mentally: CO = 7%.

In order to find the percent excess air we first have to locate the points of intersection of *ab* with the reference lines *E* and *G*: c and *e* respectively. Again the line *fe* is made to cut the *A* scale and this point of intersection, *k*, is joined to c. The line *kc* cuts the scale *D* giving the value of the 7.8% excess air.

EXAMPLE 5

Given: 5% O_2, 7% CO, 19% max. CO_2.
Find: %CO_2 and % excess air.

Again it can be assumed that the max. % CO_2 for a certain fuel is a pre-fixed number. Since the % CO_2 is unknown, we shall join the % O_2 (point a on the A scale), to an arbitrary % CO_2, for instance 2 (point *b'*). To this value we add mentally the known 7% CO, giving 9 (point *f'*). If the line joining a to *b'* is made to cut the reference line *F* and this point of intersection *d'*, being the center of projection, is joined to *f'*, the line *f'd'* cuts the scale A at g. Align this point with the known max. % CO_2, (i.e. 19, point *h* on the *C* scale), cutting the scale *B* at 17 the value of (% CO + CO_2) namely 17 (point *f* on the *B* scale). Since the % CO is known, the % CO_2 can then be readily computed mentally: CO_2 = 10%.

In order to find the % excess air, line *gh* is made to cut the reference line *F* at a point *d* and this point of intersection is joined to the 5% O_2 (point a on the *A* scale). This line *ad* should cut the *B* scale at the graduation giving the % CO_2 which has been calculated mentally. Line *ad* cuts the reference lines *E* and *G* at c and *e* respectively. Again the *fe* is made to cut the *A* scale and this point of intersection, *k*, is joined to c. Then *kc* cuts the scale *D* at the graduation giving the desired value of the excess air: 7.8%.

* The operations designated by an asterisk must be carried out according to Eqs. (1) and (2b); however, when using the reference lines *E*, *F* and *G* in the right way the computations of ($O_2 - 0.395 \times CO$), ($O_2 - 0.5 \times CO$) and ($CO_2 + CO \times 31.5/21$) need not be made. It is only necessary to calculate mentally ($CO_2 + CO$).

Editorial Viewpoints

More Business, Less Profit

Six of eight chemical companies reporting to the National Industrial Conference Board's semi-annual survey indicate better business prospects for the balance of 1952. Only two now see less sales than had been anticipated last December. One will be off 8-9 percent from last year, the other expects a drop of as much as 20 percent. All the others look forward to sales gains ranging from 3 to 15 percent.

Significantly none of the chemical manufacturers has deemed it necessary to curtail plans for capital expenditures. Five companies will spend as much or more than in 1951.

But it's a different story on profits *after* taxes. Four companies hope profits will be "the same as in 1951" but the other four report "lower," "down 5-6 percent," "off 7 percent" and "50 percent less." At that, we are better off than industries more directly affected by rising labor and material costs.

Keep Up the Good Work

Missionary work is continuing at the high-school level to alleviate the current shortage of engineers and scientists. A wide variety of agencies participate in this program. Many industries are generously supporting the work of the Engineering Manpower Commission and other activities sponsored by the engineering profession. The research committee of the National Association of Manufacturers has distributed more than a half million copies of an attractive pamphlet on scientific and engineering careers. Special exhibits have been prepared for meetings of science teachers, vocational counsellors and other guidance groups in the secondary schools. But there is still need for more intimate, personalized services in many industrial communities.

President Jess H. Davis of Stevens has a worthwhile suggestion in this connection. To attract young men to engineering, he believes that industry must call more attention to the men behind its processes and products. He urges companies to turn loose all their techniques of modern advertising and promotion to do a real selling job in dramatizing and personalizing the role of the engineer in industry. He feels that this sort of effort is needed now to arouse more interest in engineering—among parents as well as their sons and daughters.

This summer is a good time to make plans and open up channels of communication that will take your story to the people and institutions where it will do the most good.

Meanwhile don't underestimate what you can do as an individual in getting better acquainted with the most important citizens of your community—those in the high schools who teach and guide our future engineers.

"Wake up, America"

Germany is back in the chemical business and intends to stay. That is the consensus of industry observers who visited the recent technical fair in Hanover and ACHEMA X, the great international engineering congress and equipment exposition at Frankfurt. All were impressed with the vigor of Germany's comeback and her strong bid for her former position in the world's chemical trade.

Our visitors may have found some satisfaction in the number of products at Hanover which were obviously and admittedly based on American research. There were a half dozen different fluorine-based plastics of the "Teflon-type," polystyrene foam for insulation, wrapping materials of polyvinyl and polyethylene films, antibiotics and other American developed pharmaceuticals.

Our representative at Frankfurt was more amazed by the size and variety of equipment than by the novelty of its design and construction. But he also noted that business was brisk. Advertising literature was being pushed aside for blueprints and working drawings. He saw orders being taken for immediate delivery to Turkey and South America. He drew some bitter contrasts between the serious minded German engineers with their slide rules and handbooks and the tired and bored salesmen who so often man similar exhibits in this country.

His warning was: "Wake up, America. It's later than we think."

How Old is "Petty"?

Another urgent phone call from Wall Street: "Please, Mr. Editor, can you help us find a flowsheet of the Petrochemical Industry? Also a list of its intermediate and finished products." Ever since "Petty" became the glamour girl of the chemical chorus, everybody seems to be shouting her praises. But we often wonder how many of her new admirers would be shocked to know how old the gal really is and how she got her new name and where she came from!

Admittedly, we have made no comprehensive research into the lady's age. But in preparing this anniversary volume we ran across an article on isopropyl

alcohol from petroleum which we had written 30 years ago. We also recalled how our first Chemical Engineering Award went to Carbide in 1933 for the creation of a "great synthetic aliphatic chemical industry based on the hydrocarbons of petroleum and natural gas." We did not think to call it a petrochemical industry because, as Dr. George Curme still persists in pointing out, that word is a "monstrous, mongrel misnomer," actually derived from the Latin "petro" meaning rock plus the English "chemical" to mean "rock chemicals."

We continued to ignore the lady's existence as late as 1939 when Standard Oil Development was recognized for the "Triumph of a New Technology" in the production of special chemicals from petroleum. Not until the 1948 award to Shell Development, did we have the courage or audacity to head our editorial citation "For Petrochemical Progress." And then a year later we garbed the lady in the beautiful fabrics of Celanese and she was fast on her way to fame and glamour.

All this we mention only because so many of our journalistic friends among the newspapers and on some of the petroleum journals act as though they have just made a great new discovery. One promises "the most complete editorial coverage ever devoted by any oil or chemical publication to America's fastest growing industry."

We might be jealous, but we're not. "Petty" by any name is an old and cherished friend, well deserving of her new billing as chemistry's darling.

Growing Up With Used Equipment

Student chemical engineers usually get their introduction to process equipment in a university laboratory. The chances are they will work with filters, mixers, kettles and evaporators that once saw service in some process industry. On his first job the young graduate often finds himself in a pilot plant, using equipment that has been rebuilt or adapted to a variety of projects. Later on in his career he learns from experience some of the many reasons why an investment in used equipment is often a matter of good business judgment.

Chemical engineering as a profession has also grown up with the used-equipment industry, often without recognizing its important role in our progress. Looking back over the years we have been impressed with many valuable services that are performed by the organizations that deal with the surplus and used machinery of the process industries. In periods of scarcity the availability of just the piece of equipment you need for an urgent project may prove a tremendous saving in time and money. Or your problem may be one of experimental production where something is needed for limited use in semi-works or pilot plant. Or we can all recall instances where limited funds have made it necessary to start operations with a minimum capital investment. Many chemical companies had such modest beginnings.

Nor should we overlook a most important and necessary service in connection with occasional liquidations and public auctions of complete process plants. Some of these run into millions of dollars. Without the specialized knowledge and facilities of the used-equipment industry, valuable resources would be dissipated, perhaps at a time when they were sorely needed in other fields. Fortunately the industry has made a lot of progress in learning how to recondition equipment and to adapt it for different applications and processes.

This fiftieth anniversary issue of *Chemical Engineering* seems an appropriate occasion to point out some of the significant ways in which the used-equipment industry has served our profession. Its reputable dealers are not fly-by-night operators. Many have been in business since the early days of this chemical century. All are proud to be recognized for their contributions to the advances and achievements of the process industries.

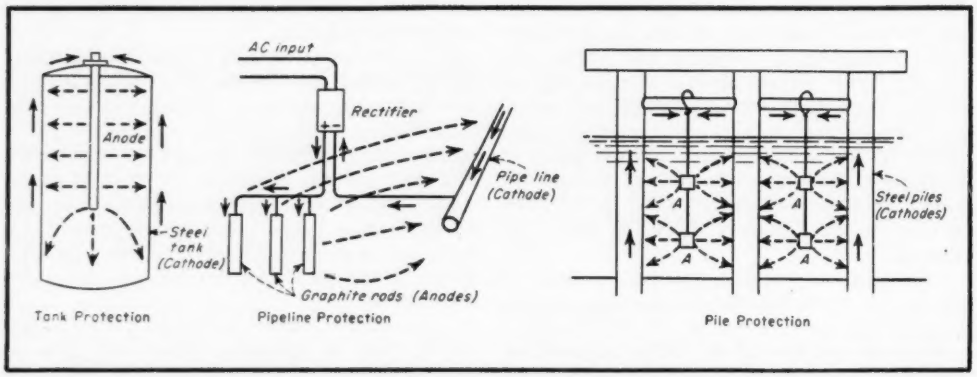
Less Natural Gas for Industry

The chemical industry has long been a preferred customer for natural gas supplied by pipelines to points far from the source of the gas. The pipeline companies prized most the continuous process industries which took gas day and night the year round. If they had an outlet for a substantial part of their supply with such industrial users, then the average cost of delivery of the gas became a minimum.

Such industrial customers got a preferred gas rate because of the high capacity load factor they provided. Now there is another means for reaching these high load factors, and the attractiveness of the chemical industry as a customer seems correspondingly lessened. This is going to make it more difficult for individual gas buyers to get favorable prices and assurance of continued supply beyond the end of present contract periods.

The new competitor is, strangely enough, one of very low capacity load factor. It is the demand for gas to re-pressure underground storage areas. This demand can be made seasonal or otherwise variable so that all of the storage is filled from off-hour or off-season transmission. Furthermore, when the off-peak gas is so used, it remains in possession of the pipeline company for later sale at higher seasonal prices.

Not all pipelines can use this technic though a surprising number have developed it very successfully. As the new method of summer storage for winter use develops, it is going to be increasingly difficult to get gas for chemical enterprises. This is a fact many company managements must face and a problem which they must undertake to solve before present contracts for gas supply expire.



Cathodic protection systems. Dotted lines show current flow through the electrolyte (ground water, sea water, etc.) from anode to cathode. Method shown for tank protection is in general applicable to heat exchangers, chemical reaction vessels, etc.

Cathodic Engineering Preview

Cathodic protection will inevitably find diversified use in the chemical industry for protecting reaction vessels and piping. Here are some of the principles.

T. E. NICHOLAS

Only way in which atoms of a protected metal may detach themselves from the surface and enter into solution is in the form of positive charged ions. Wherever there is water there are some hydrogen ions formed by its dissociation, and these ions are always available to give up their charge to the metal atoms.

Cathodic protection functions by maintaining at the surface of the metal to be protected a continuous supply of negative electricity to neutralize any and all positive ions which reach the surface. When this is done, the atoms of metal cannot obtain positive charges from the solution, and thus cannot become ions. If they cannot become ions, they cannot dissolve and there can be no corrosion.

To maintain a structure under complete cathodic protection it is necessary that there be a negative charge at every point on the surface of the metal to neutralize the hydrogen ions which are in the soil or water.

Cross country pipelines would not be economical if it were not for cathodic protection. There are two general classes of cathodic protection. One consists of placing anodes of magnesium, zinc or aluminum which corrode while the steel pipe which becomes the cathode is protected. The other method consists of impressing direct current in a direction so it enters the pipe from the soil. Carbon and scrap iron are often used as anodes for impressed current installations.

THOMAS E. NICHOLAS *is a consulting engineer who is engaged in design, development and patent work in the engineering field.*

CURRENTS REQUIRED

Pipe lines in soil require from 1 to 2 ma. per sq. ft. of exposed surface. It is often necessary, however to supply a higher average current density since uniform current distribution is difficult to attain.

Steel surfaces in contact with fresh water at low velocities such as the interior of water tanks require from 2 to 6 ma. per sq. ft. for complete protection.

Surfaces exposed to water in motion require higher current densities. As high as 10 to 12 ma. per sq. ft. of surface may be required under such conditions.

Steel in sea water requires 15 to 30 ma. per sq. ft. to place it under immediate protection. If the surface is first subjected to several days treatment at high current densities of about 50 to 100 ma. per sq. ft. a dense calcareous coating will be built up and protection may then be maintained indefinitely at the low value of 2 to 3 ma. Any accidental injury to the coating will result in a temporary concentration of current to repair it.

LIMITATIONS

Cathodic protection is not useful for protecting against atmospheric corrosion nor reaction at elevated temperatures. Pipes protected on the outside still corrode on the inside. For inside protection, special provision must be made such as placing a rod or wire as the anode for the entire length of the pipe.

Zinc coating protects the underlying steel from rust by the principle of cathodic protection and is effective for atmospheric, underwater and some soil exposures. In the last few years however, it has been found that zinc is not always protective. In contact with some hot waters about 140 deg. F. the zinc coating may become the cathode and thereby accelerate pitting and failure of steel.

WITH WRAPPING

Present practice requires all main pipe lines to be coated with plasticized coal tar enamel, a wrap of glass and kraft paper. The added amount that may be spent for a more elaborate coating procedure can be used more economically by providing cathodic protection.

Rectifiers and magnesium anodes are preferred for cathodic protection.

Where magnesium anodes are used they are distributed throughout the system. Anode locations are determined by making soil resistivity measurements and upon consideration of the pipe area to be protected. Anodes should be placed from 6 to 10 ft. away from the pipe and from 6 to 8 ft. deep.

Where the pipe is very deep, it may involve less work to set the anode 8 to 10 ft. deeper than the pipe, boring the anode hole alongside the line in the same ditch. After the anode has been placed and wet down thoroughly, a reading of the current is taken before the actual connection to the pipe. From this reading a rough estimate of the probable life of the anode can be made using the formula TC=1,200, where T=estimated life in years, and C=initial current output in milamperes.

Attachment to the pipe should be made by welding or brazing. A convenient method is the Coldweld (thermite) process.

During the first few months of such cathodic protection, pipe to copper sulphate electrode potentials will be a good deal in excess of 1.0 v. which it is expected to maintain on a well coated system. On a poor coating 0.90 v. and on bare pipe 0.85 v. is sufficient.

LOCATING HOT SPOTS

Since it is rarely economical to attempt the complete cathodic protection of a totally bare line it becomes necessary to locate the "hot spots" in order to place the protection where it is most needed. Properly distributed "hot spot" protection may be expected to prevent up to 90 percent of the leaks at the cost of about 15 percent of that of complete protection.

Most positive indication of a "hot spot" is a leak in the line. This method of locating them is not recommended as a general practice. It has been established that there exists a very close relation between corrosiveness in soil and its electrical resistivity. This easily measured quantity will locate the "hot spots" before the leaks make them obvious.

Most commonly used instrument is a single rod apparatus, consisting of a steel rod with a metal tip insulated from the rod proper, and a small battery powered alternating current bridge, using a pair of headphones to indicate balance. The resistance of the soil in the vicinity of the rod tip is compared with an adjustable resistance in the instrument. The resulting reading multiplied by the rod constant gives the resistivity directly in ohm-cm.

Readings are taken near pipe depth and at intervals ranging from as little as 10 ft. up to 400 ft. It is important to note all significant changes. About ten miles per day can be covered in this manner by two men. The values thus determined are plotted on semi-logarithmic paper as a resistivity profile of the line. The logarithmic scale is necessary for the resistivity as it is the percentage comparisons that are important. The following rules may be used for guidance: (1) Values below 1,000 ohm-cm. are almost always corrosive except when they are the highest values in a long section of line. (2) Values above 10,000 ohm-cm. are almost never corrosive. (3) Values between 1,000 and 10,000 must be interpreted by comparison with the adjacent sections.

One type of severely corrosive area will not be discovered by such a survey. That is one in which the pipe is buried in soil contaminated with cinders or other foreign particles of inherently low resistivity.

Anodes which are placed in soil of low resistivity so that their current output exceeds that for the desired life may be controlled by the insertion in their lead wires of suitable resistors. These are usually adjusted by trial. In attempting to increase the output in high resistance soils by merely placing the anodes closer to the pipe, most of the current will flow to the pipe in the immediate vicinity, and the sections between anodes may not receive adequate protection.

Where a hot spot is encountered, such as a salt water ditch or drain, this method is satisfactory since it concentrates the current where it is most needed.

Insertion of resistors to control the current should be deferred for a period of two weeks if possible. If this cannot be done, connect all of the anodes at a given location before adjusting any and then restrict current to about 50 percent above the desired value to allow for reduction due to polarization of the pipe.

A 0.01 ohm shunt should be installed at particular location in the anode lead so that current output may be read from time to time with a potentiometer in order to check the performance of the system.

With a potentiometer a corrosion engineer can measure the pipe to soil potentials using a copper sulphate electrode; he can measure the potentials between any two protected or unprotected structures; he can measure the potential developed by the various protective devices although the latter may sometimes require the use of the voltage dividers to extend the range of the instrument. In the most common applications, pipe to soil potential measurement, the big advantage of the potentiometer is that it draws no current at perfect balance and hence does not disturb the system being investigated. Even a comparatively high resistance voltmeter may read as much as 50 percent low if the soil is dry; the only effect on the potentiometer is a loss of sensitivity.

With a suitable supply of external shunts currents may be read from milamperes to as high a range as hundreds of amperes if needed.

Soil composition including water, soil resistivity measurements, ground water levels, rainfall, drainage, location relative to power installations and pH determinations are all important in cathodic protection. Soils containing gypsum or iron sulphides, soils with low electrical resistance, less than 500 ohms per cc. and soils with low pH should be avoided if possible in routing a pipe line.

CROSSING PIPE LINES

There is danger of interference between two crossing pipe lines when the lines are very close together at the crossing point. If either of the lines is under cathodic protection, there may be damage inflicted upon the other line. Even if proper precautions such as crossbanding are taken, additional power is required if they are close together. A separation of at least 12 in. or even more is justified in the added economy of corrosion protection. In addition to adequate separation the quality of the coating should be especially good on either side of the pipe crossing for several ft. in order to decrease the exposure.

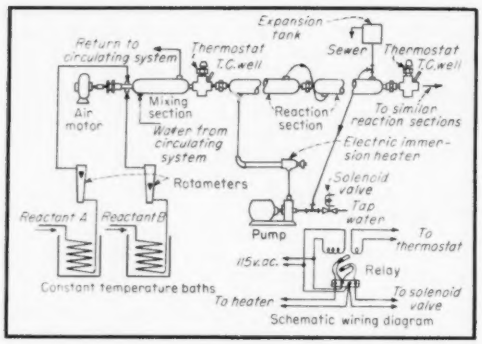
Recent installation of a cathode protective system in the city of Anacortes, Wash. has substantially reduced leakage in a 2,500 ft. line of 24 in. steel pipe. The pipe line is exposed to extremely corrosive conditions due to being laid in a salt brine marsh.

The cathodic protective installation has specially treated graphite anodes buried about 200 ft. apart with junction boxes extending 6 in. above grade. A transformer rectifier unit is located approximately at the center of the installation. From here a positive wire runs to the buried graphite anodes and a negative wire extends 40 ft. under a road to the pipeline on the opposite side.

Direct current from the transformer rectifier unit is impressed upon the graphite anodes and radiates thru the soil, which acts as the electrolyte to the metal pipe. The current enters the metal surfaces of the pipe and opposes the electro-chemical action.

The Plant Notebook

Edited by Theodore R. Olive



Temperature Control System for an Experimental Pipeline Reactor

IRVING H. COOPER, *Project Engineer, Chemical Research Div., Heyden Chemical Corp., Garfield, N. J.*

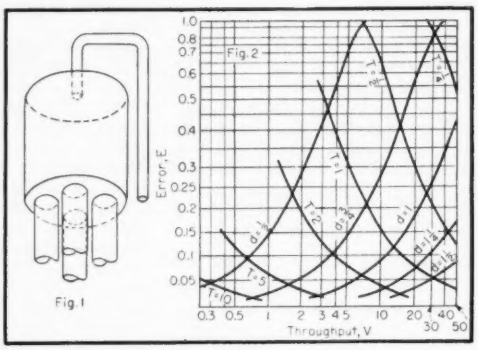
★ **May Contest Prize Winner**

Often it is desirable to investigate the possibility of converting a batchwise chemical process into a continuous one. The accompanying diagram indicates the main features of a pilot scale set-up which has been used successfully for such an investigation involving two or more liquids. It consists essentially of units of two or more sections of jacketed pipe through which flows the reaction mixture, after it has thoroughly mixed in a preceding jacketed section.

The temperature of each unit (or zone) is closely maintained by means of water rapidly circulated through the jackets of the pipe sections. The circulating liquid is heated by means of an electric immersion heater (Chromalox Type RI, or similar) or cooled by tap water added through a solenoid valve. The heater and solenoid valve are operated by a single-pole, double-throw relay (such as a Mercoid V3-156A108) which, in turn, is activated by a Fenwal Thermoswitch (Cat. No. 17110) mounted in a pipe cross directly in the path of the reaction mixture as it leaves the controlled zone. Circulation is provided by a continuously operating centrifugal pump of suitable capacity (such as an Eastern, Model D or E).

Temperatures of the various zones in the apparatus are readily controlled within about ±2 deg. C. and are measured by means of light-gage thermocouples inserted into ⅛-in. diameter wells in the pipe crosses and connected to a multi-point recorder. If permanent temperature records are not required, small all-metal thermometers (such as Weston, Models 2261 or 2282) may be substituted for the recorder and thermocouples.

Any number of these zones can be connected in series to permit a reaction to be carried out stepwise at various temperatures, if desired, or to increase the reaction time at a fixed temperature. Pipe sizes can be increased for larger flow rates but it is desirable to use the smaller diameters in order to have favorable heat transfer conditions. If still closer control is desired, two-position thermostats with high and low contacts can be used instead of the single-contact type shown. Insulation of pipe sections and connecting tubing is desirable, whenever possible.



Continuous Gas Density Meter Weighs Gas Against Air

H. KERNER *and* R. W. KING, *Petrocarbon Ltd., Manchester, England.*

Continuous gas density measurement often compares favorably in simplicity, robustness and cost with alternative methods for checking on the performance of physical or chemical processes. Indeed, there are few systems involving gases where a continuous indication of the density difference against a reference gas such as air, or perhaps against the feed material, would not be valuable.

★ **June Contest Prize Winner**

"Simple Design for a Variable-Temperature Kettle Heating System."

A prize of $50 in cash will be awarded to Joseph I. Lacey, Hooker Electrochemical Co., Niagara Falls, N. Y. Mr. Lacey's novel and interesting idea will appear in The Plant Notebook for August.

$50 PRIZE FOR A GOOD IDEA—Until further notice the Editors of *Chemical Engineering*, will award $50 cash each month to the author of the best short article received that month and accepted for publication in the Plant Notebook. Each month's winner will be announced the following month and published the second following month.

$100 ANNUAL PRIZE—At the end of each year the monthly winners will be rejudged to determine the year's best Plant Notebook article, which will then be awarded an additional $100 prize.

HOW TO ENTER CONTEST—Any reader of *Chemical Engineering*, other than a McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable material must be previously unpublished and should be short, preferably not over 500 words, but illustrated if possible. Articles which are acceptable but are not winners will be published at regular space rates ($10 minimum).

Articles may deal with plant or production "kinks," or novel means of presenting useful data, which will interest chemical engineers. Address Plant Notebook Editor, *Chemical Engineering*, 330 West 42nd St., New York 36, N. Y.

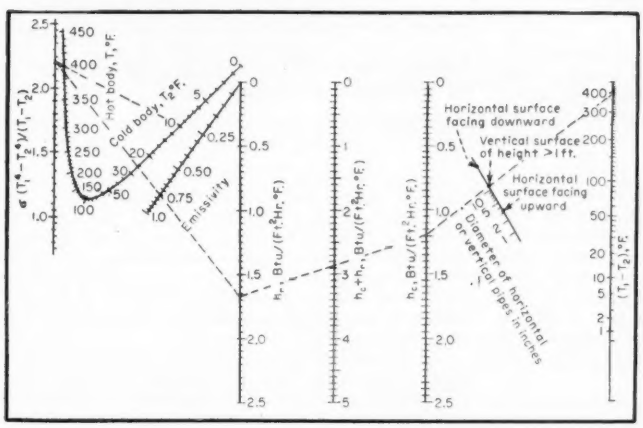
The idea of putting up a tall pipe containing the gas and balancing its weight on a gage against the surrounding air, or a reference gas, is not new in the manufactured gas industry, but it may be novel to many. It is basically simple and gets away from complicated and expensive mechanisms. However, there are a number of practical points if the method is to be used successfully.

If we take 40 ft. of vertical pipe as a reasonable length, then a unit difference in molecular weight (which is 1/380 at 60 deg. F. and 1 atm., or about 0.0026 lb. per cu. ft. difference in density) gives a gage reading of 0.02 in. w.c., or up to about 0.5 in. on an inclined draft gage with a suitable gage liquid. Hence, density differences of the order of 0.5 mole weight units can be detected quite satisfactorily.

It is best not to use a single pipe, since the gage reading may be affected by temperature differences between the pipe and the ambient air. Also, there may be troublesome fluctuations due to gusts of wind. These effects can be minimized by using at least two pipes, but the versatility of the meter can be increased at small cost by using still more pipes, connected together at the top as suggested for four pipes in Fig. 1. The pipes may be erected in the open, or run up the outside of the building. The several gases, including usually dry air as the reference gas of known density, are then passed in at the bottom of the pipes. Each pipe is tapped at the same level, and usually a few inches above the bottom, for the gage connections. The connections should be kept horizontal and the gage installed at the same level so that the (usually unknown) gas composition in the connections will not affect the readings.

There is a further source of error in the pressure drop due to gas flow. This effect can be eliminated by taking readings immediately after shutting off the flow, using small diameter pipes and lose plugs at the top of the pipes to reduce diffusion. This method is particularly suitable when the available gas volumes are small, or only occasional readings are needed. But if continuous operation is desired, a correction from Fig. 2 can offset the flow error. Since the flow in the pipes will be streamline in most cases of practical importance, then the flow rates will be inversely proportional to the viscosities. In practice it will usually be easier to make the flow rates approximately equal, in which case the error introduced can reasonably be taken as due to half the pressure drops arising from flow remaining uncompensated.

The relations between this error and throughput in cfh., purging time in min., and pipe diameter in inches are given in Fig. 2. The actual errors are proportional to gas viscosity (here assumed as 0.01 cp.); and the purging time to pipe length (here taken as 40 ft.). It is clear that as pipe diameter and throughput increase, more favorable compromises between error and purging time become possible, but with greater gas consumption and pipe cost. In an actual case ¾-in. pipe was used, with a throughput of 2 cfh., giving a purging time of about 4 min. and an expected error of about 0.06 mole weight units. Obviously, constancy of gas composition is desired over periods that are long compared with the purging time.


Hot body, T, °F
Cold body, T, °F
Emissivity
Horizontal surface facing downward
Vertical surface of height >1 ft.
Horizontal surface facing upward
Diameter of horizontal or vertical pipes in inches

Nomograph for Combined Radiation and Convection Heat Transfer Coefficient

R. M. Butler, *Chemical Engineering Laboratories, Queen's University, Kingston, Ont., Canada.*

In designing chemical plants one often wants to be able to estimate the rate at which heat will be lost from the exterior surfaces of equipment. The nomograph above permits a rapid estimate to be made of the combined heat transfer coefficient due to both radiation and convection.

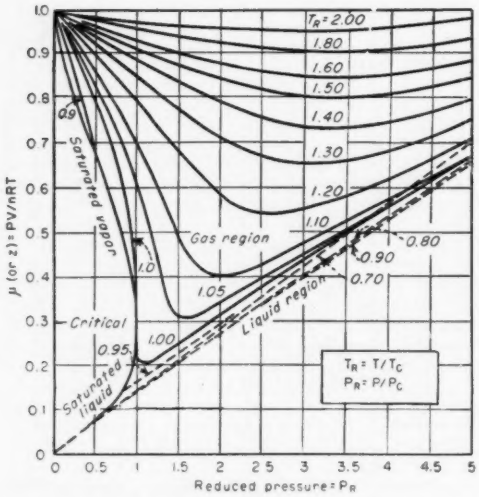
The chart solves the equation: $h_r + h_c = K(T_1 - T_2)^{1/4} + 0.173\ e\ [(T_1/100)^4 - (T_2/100)^4]/(T_1 - T_2)$.

Values of K for the equation (from McAdams, "Heat Transmission," 2nd Ed., p. 240, McGraw-Hill, 1942) depend on the type and position of the heat transferring surface and may be taken as 0.2 for horizontal plates facing downward; 0.27 for vertical surfaces of height greater than 1 ft.; 0.38 for horizontal surfaces facing upward; and as $0.27/D_o^{1/4}$ for vertical or horizontal pipes. These values have been incorporated into the nomograph by means of the scale second from the right.

In using the chart a line joining the hot body temperature T_1 with the cold body temperature T_2 on the curved scale is extended to intersect the extreme left hand scale. This intersection gives the value of the heat transfer coefficient due to radiation alone, assuming the radiating surface to be a black body. Drawing a line from this point through the appropriate emissivity value and continuing it to the h_r scale corrects for departure from black body conditions. The value of h_c is then obtained by drawing a line from the temperature difference scale at the right, through the small K-value scale to the h_c scale. A line connecting the h_r and h_c values adds the two coefficients on the $h_r + h_c$ scale.

As an example, what will the combined coefficient be when the hot and cold body temperatures are respectively 400 and 10 deg. F. if the hot surface is vertical and is more than 1 ft. in height? Take the emissivity at 0.75.

Connecting the temperature values of 400 and 10 deg. F. and extending to the left hand scale gives a black-body radiation coefficient of 2.2 which, corrected for 0.75 emissivity, gives an h_r value of 1.68. Extending a line from 400 − 10 = 390 deg. F. through the point for a vertical surface gives an h_c value of 1.2. Adding the two h values nomographically gives the combined coefficient as 2.88.



Formula Gives Temperature Change of Gases With Varying Pressure

ROBERT G. WARRICK, *Chemical Engineer, The H. K. Ferguson Co., Cleveland, Ohio.*

Here is a quick and easy method of determining the temperature change of a gaseous system with varying pressure. The formula is adaptable to the slide rule and fairly easy to remember.

This method is based on the first law of thermodynamics and the assumption that the gases obey the perfect gas law, $PV = WRT/M$. In cases that do not follow the perfect gas law, a constant μ (sometimes called z) can be determined from the reduced pressure graph (above) and substituted into the final formula.

Assume that the perfect gas law holds. Let E equal the internal energy of the gases; W equal the average weight; M equal the average molecular weight; C_p equal the average specific heat of the gases between the initial and final pressures; P equal pressure in absolute terms; T equal absolute temperature; and R be a gas constant.

In the compression of a gas the heat loss to the surroundings is negligible. From the first law of thermodynamics, $E = q - w$, where $dE = WC_p\,dT$; $dq = 0$; and $dw = P\,dV = (WR/M)dt - (WRT/M)dP/P$. Substituting in the first law and integrating:

$$\left(WC_p + \frac{WR}{M}\right) \ln \frac{T_2}{T_1} = \frac{WR}{M} \ln \frac{P_2}{P_1}$$

Separating terms.

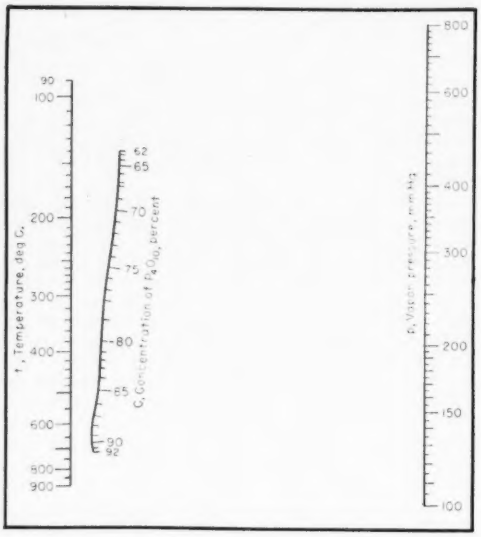
$$T_2 = T_1 \left(\frac{P_2}{P_1}\right)^{\frac{1}{\frac{0.503\ MC_p}{\mu} + 1}}$$

If a μ term is used, the power in the above equation is

$$\frac{1}{\left(\frac{0.503\ MC_p}{\mu}\right) + 1}$$

In cases where small amounts of solids are carried in the gas stream it is possible to determine the temperature rise with pressure change by using the integrated form of the equation. This is done by adding to the terms in parentheses on the lefthand side of the equation W_sC_{ps}, where W_s is the weight of the solids and C_{ps} is the specific heat of the solids.

This versatile little formula, therefore, can cope with practically all the gaseous systems that utilize varying pressures in your plant.



Nomograph Gives Vapor Pressures Of Phosphoric Acids

D. S. DAVIS, *Professor of Chemical Engineering, Virginia Polytechnic Institute, Blacksburg, Va.*

Brown and Whitt (*Ind. Eng. Chem.* **44,** 615, 1952) presented data, in the form of tables and plots, on the vapor pressures of phosphoric acids of concentrations between 67.6 and 92.7 per cent of P_4O_{10}. Since the coverage is for temperatures and concentrations at irregular intervals, there is evident need for a convenient graphical presentation that will permit reliable estimation of vapor pressure for any temperature and concentration within the range of the original investigation.

The accompanying line coordinate chart incorporates these features and extends the usefulness of the basic data. It is predicated on values, determined by Brown and Whitt, of A and B in the equation $\log p = A - B/(t + 273)$ where p = vapor pressure, millimeters of mercury; t = temperature, deg. C.; and A and B depend upon C, the concentration of P_4O_{10} in the phosphoric acids.

The use of the nomograph is illustrated as follows: What is the vapor pressure of phosphoric acid that contains 75 percent of P_4O_{10} at 270 deg. C.? Connect 270 on the t scale and 75 on the C scale with a straight line and note the intersection on the p scale at 380 mm. of mercury. At what concentration of P_4O_{10} will a phosphoric acid exhibit a vapor pressure of 300 mm. of mercury at 200 deg. C.? Connect 200 on the t scale and 300 on the p scale with a straight line and note the intersection with the C scale at 71 percent.

The chart should not be used for concentrations between 78 and 79 per cent P_4O_{10}, in which range the original data appear to be slightly erratic. Elsewhere the agreement between chart and data is satisfactory.

corrosion resistant ACE® HARD RUBBER

The famous Jabsco neoprene impeller, self-priming pump—generally recognized as the pump which delivers more liquid within its pressure range than any other pump in its weight, size and price class—is now available in hard rubber construction for handling acids, alkalies and other corrosive solutions at moderate cost.

High capacity—the new Ace-Jabsco pump delivers 15 gpm. at 22 ft. head, ranging to 5 gpm. at 72 ft. head. It is suitable for alkalies, solutions of metallic salts, inorganic acids, hydrochloric acid any strength, and many other corrosives. It pumps thick or thin liquids.

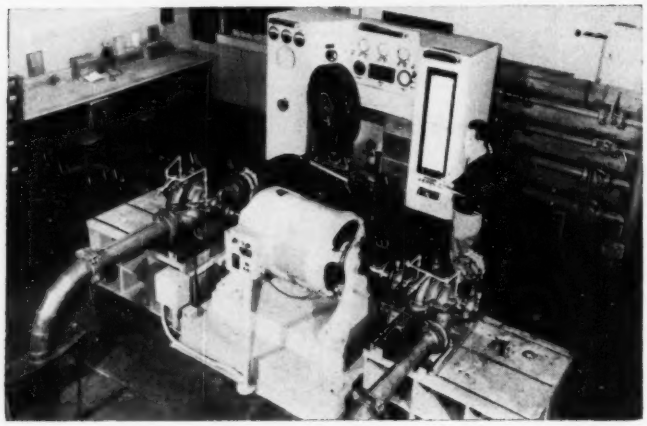
Self-priming—starts instantly against suction lifts up to 6 ft. without a foot valve. Will lift as much as 14 ft. on suction side when primed. Self-lubricated flexible neoprene impeller outlasts conventional metal rotors and can be removed simply by taking off cover plate.

Made by American Hard Rubber Company—where quality has been a heritage for 101 years in the production of rubber-protected tanks, pumps, valves, fittings, pipe, utensils, and other equipment of rubber or plastics for industry.

ACE rubber and plastic products

AMERICAN HARD RUBBER COMPANY
93 WORTH STREET • NEW YORK 13, N. Y.

NEW FLUIDS HANDLING EQUIPMENT



Pump Tests Simulate End Use

Newly designed testing station gives increased accuracy at one-fourth the cost.

Centrifugal pump testing stations designed to give a complete reproduction of end use performance for pumps of all sizes and ratings are now being used for production testing of finished pumps. These stations employ the most modern of test techniques, based on current standards, and offer an accuracy difficult to attain with previous test procedures. Savings in testing time and man-hours have effectively cut testing cost to 25 percent of previously established figures.

As seen in the picture above, the test installation consists of a double-ended electric dynamometer, with suitable pump mountings, and instruments which are tied in to a central control panel.

The dynamometer is mounted on an electrically powered automatic lift located between two pre-aligned pump bedplates. The lift is controlled by pushbuttons so that the operator can readily secure proper height alignment within 0.022 in. The double-ended feature of the dynamometer permits testing pumps with either right-hand or left-hand rotation. Several other features, including a 1-ton overhead electric crane, have pared setup time to a minimum.

Piping is tied in with water reservoirs having a total capacity of 400,000 gal. Pump suction piping is deeply submerged in a swirl or vortex pool of water. Pump discharge is carried through a flexible hose into a pipe system below the operating level of the pump. This water is then metered through a bank of calibrated venturis that can be operated singly or in parallel.

The system head is low, but by use of a motor-operated valve additional friction is created so that pumps can be tested over a wide range of heads. No priming is required, and the system is free of air locks.

Special eccentric pipe reducers and quick-connecting adapters allow pumps being tested to be tied in to the system very rapidly.

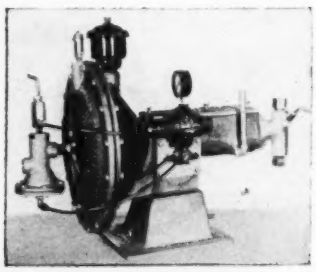
The instrument section of the installation enables the test engineer to obtain complete hydraulic and electrical data with maximum ease and speed. For instance, the venturi manometers are calibrated to read directly in gpm. Desired flow rates can then be set by the operator.

The permanent nature of the installation permits use of sensitive and accurate gages to measure discharge pressures. Three laboratory-type gages for measuring pressure have full-scale readings of 75 ft., 150 ft., and 350 ft., respectively. Included in the control cabinet panel is a gage tester, so that gages can be calibrated in a matter of seconds. To supplement the pressure gages, the manometer panel has two manometers reading directly in feet of water and an additional manometer to measure the lift applied to the pump.

Motor torque is indicated on a standard springless scale and may be read to 0.1 lb. on one of the control panel dials. A field and armature ammeter as well as a voltmeter are included.

Dynamometer speed is controlled by the use of two field rheostats. The use of a voltage regulator essentially eliminates voltage fluctuations. Speeds are set approximately with a synchronous electrical tachometer and held accurately by means of a stroboscopic light.

Before starting a test, the engineer carefully reads an order card which states the complete hydraulic and electrical data for the end-use installation of the pump being tested. The customer's operating conditions are then simulated at the control desk and the test engineer operates the pump at the rated speed of the customer's motor and records data for a minimum of six test points. Readings are taken only after conditions have become stable.—*De Laval Steam Turbine Co., Trenton 2, N. J.*



Chemical Injector Pump Develops High Pressures

Injection of liquid chemical into another liquid against 100 to 20,000 psi. at rates of ½ pt. to 360 gal. per 24 hr. is the function of this new chemical injector pump. Originally developed to inject chromates and other rust inhibitors into high-pressure oil

Equipment Cost Indexes

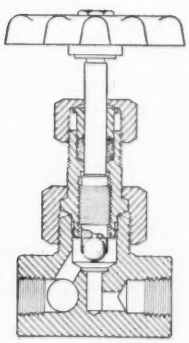
(Marshall and Stevens Indexes of Comparative Equipment Costs, 1926 = 100)

	Mar.	Dec.	Mar.
Industry	1951	1951	1952
Average of all	181.2	177.1	180.2
Process Industries			
Cement mfg.	174.0	169.5	172.8
Chemical	182.0	177.5	180.8
Clay products	169.0	164.5	167.8
Glass mfg.	172.1	167.6	170.9
Paint mfg.	175.3	170.8	174.1
Paper mfg.	175.6	171.1	174.4
Petroleum ind.	178.4	173.9	177.2
Rubber ind.	180.8	176.3	179.6
Process ind. avg.	179.4	174.9	178.2
Related Industries			
Elec. power equip.	183.6	179.1	182.4
Mining, milling	182.7	178.2	181.5
Refrigerating	201.0	195.8	200.3
Steam power	171.2	166.7	170.0

Compiled quarterly for March, June, September and December of each year by Mashall and Stevens, evaluation engineers, Chicago and Los Angeles. Indexes are prepared for 47 different industries, from which the eight process and four related industries listed here are selected. Published each month with the latest available revision. For a description of the method of obtaining the index numbers see R. W. Stevens, **Chemical Engineering**, Nov. 1947, pp. 124-6. For a listing of annual averages since 1913 see **Chemical Engineering**, Feb. 1952, p. 191.

and gas lines, the pump is also finding usage in handling other chemicals, as a booster pump for hydraulic presses, for the production testing of valves, castings and piping systems, and for laboratory use.

Air, gas, water or steam at pressures from 5 to 50 psi. supply the motive power. In the above cut, the driving end is on the left while the output side is on the right. Total weight of the pump is only 62 lb.—*Texsteam Corp.*, 320 *Hughes St.*, *Houston* 11, *Tex.*



Ball Valve Provides Tight Seat

Tight positive shut-off at working pressures up to 3,000 psi. is claimed for a new ¼-in. ball valve of unique construction. Useful on meter manifolds, gage lines, seal chambers, bleed-off connections, sampling connections and lubricator shut-off, this valve is said to be universally adaptable in applications for liquid, gas and steam service.

Heart of the valve is a stainless steel ball which closes into a machined conical seat. The ball is retained at the end of the valve stem and is free rolling, so that every closing brings a new surface into contact with the valve seat. Alignment of ball to seat is accurately piloted by a forged steel bonnet.

Stem and packing gland are made of stainless steel. The packing, made of preformed and graphited asbestos with a plastic binder, can be easily replaced without shutting off the line pressure or interrupting the process.

The valve is available as either straight-through or angle type with either two or four connections.—*The Foxboro Co.*, *Foxboro, Mass.*

IN BRIEF—A capsulated listing of this month's newsworthy equipment.

Fluids Handling Equipment — Page

Pump Test Stand	Improves testing accuracy, cuts time	226
Chemical Injector Pump	Injects chemicals over wide pressure range	226
Ball Valve	Provides positive shut-off up to 3,000 psi	227
Midget Solenoid Valve	Has built in time delay mechanism	227
Threadless Pipe Fittings	Eliminate threads, welds in 150 psi. class	228
Batching Meter	Delivers pre-set liquid weight or volume	228
Diaphragm Control Valve	Provides special features at regular cost	228

Processing Equipment

Teflon Sheets and Tapes	Furnished in various thicknesses perforated	230
Dutch Centrifugal	Now available through U. S. distributor	230
Centrifugal	Can handle greatly increased unbalanced loads	230
Automatic Sampler	Junior model for small tonnage plants	230
Miniature Filter	Pressure leaf type for filtration studies	230

Instruments & Controls

Moisture Tester	Used for non-metallic granules or powders	232
Temperature Regulator	Regulates within 0.001 deg. F	232
Radiation Recorder	Used for monitoring continuous processes	232
Pressure Transmitter	Uses vibrating wire	232
Moisture Balance	Uses infrared drying, is fast, accurate	232
Vacuum Gage	Covers 8,000,000 to 1 range	232
Differential Colorimeter	Highly sensitive for process control work	234
Hand Tachometer	Covers range of 25 rpm. to 30,000 rpm	234
Viscosity Meter	Electric spindle type with 200 to 1 speed ratio	235
Combustion Meter	Used in exploring combustion zones	235
Flow Meter	Designed for open channels	236

Heating & Cooling Equipment

Infrared Oven	Made of pre-fabricated panels	238
Vermiculite Insulation	Helps in curing internal resin coatings	238
Heat Exchanger	Double pipe type for corrosive solutions	238
Gas Aftercooler	Redesigned to boost capacity	239
Cooling System	Combines economical use of air with water	239
Combination Burner	Instantly interchangeable for oil or gas fuel	240
Laboratory Oven	Features automatic weight circulation of air	240

Packaging & Handling Equipment

Paper-Foil Drums	Used for shipping oil and grease	242
Conveyor System	Automatically empties and washes drums	242
Pneumatic Conveyor Tubes	Transfer messages and samples in drug plant	242
Fork Truck Drum Attachment	Picks up, rotates and tilts drums	243
Polyethylene Carboy	Combines lightness and toughness	243
Giant Belt Conveyor	Transfers coal from railroad to river boats	244
Strapping Machine	Tensions strapping uniformly, spotwelds joint	244
Shipping Cartons	Are custom made, in multi-side shapes	245
Plastic Covered Rollers	Protect conveyors against corrosive conditions	245

Electrical & Mechanical Equipment

Electric Motor	Has separately cooled, built-in heat exchanger	246
Entrainment Separator	Fits wide range of pipelines	246
Insulation Fastening	For pipes, tanks and ducts	246
Oil Filter	With permanent, porous metallic medium	246
Variable Speed Transmission	New design for lighter powered units	246
Diesel Engine	Operates on natural gas fuel	246
Graph Paper	Perspective type for distortion-free drawings	247
Roller Chain	Sintered bushings give built-in lubrication	247

Midget Solenoid Valve Has Delayed Action

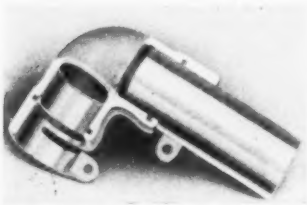
A time-delay mechanism built into a midget solenoid shut-off valve provides 5½ sec. delay between energizing of the solenoid and opening of the valve. Designed primarily for oil-burner application, the valve holds

back the flow of oil until a full stream of air is flowing through the burner.

It is felt that the time-delay feature may have some merit for process control applications.

Over-all height of this device is 2⅛-in.; ⅛-in. pipe connections provide for a flow of 15 gph. up to 150 psi. Either two-way or three-way valves are available, with brass or stainless steel bodies and stainless steel operating parts. The solenoid coil operates on 115-v., 60-cycle current.

A similar valve with a larger port opening can be furnished for 40 gph. and pressures up to 125 psi., with a time delay of approximately 6½ sec.—*Automatic Switch Co., Orange, N. J.*



New Stainless Fittings Eliminate Threads, Welds

The Quikupl, a new 150-psi. stainless steel fitting, enables you to assemble tubing or pipe without threading, flaring, sweat soldering, brazing or welding. With the Quikupl fitting, pipe or tube is simply cut to length, deburred and inserted in the fitting. The joint is completed merely by tightening a small screw.

Use of this fitting, it is claimed, greatly reduces stainless steel piping cost by permitting the use of light-wall tubing with savings up to 56 percent on weight and 52 percent on material cost. Furthermore, piping labor costs are pared to a minimum with the elimination of essentially all normal pipe fitting procedures.

Other advantages cited are better corrosion resistance through elimination of threads, high salvage rate and increased flow capacity. Pilot plants in particular gain from high salvage.

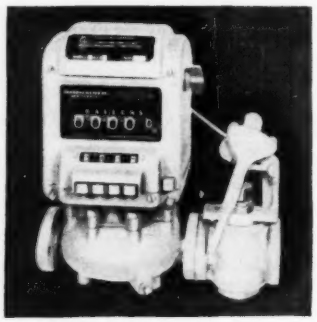
In general appearance the new stainless steel fittings resemble standard elbows, tees, ells and other universal shapes. The internal portion of the fitting, which fits around the pipe or tubing being joined, has a machined surface. A neoprene ring is mounted in an internal annular groove with its lip protruding beyond the internal wall surface.

Insertion of tubing into the fitting compresses the lip of the neoprene ring, thereby insuring a tight seal of the neoprene against the tubing outer wall. Internal pressure in the piping system simply increases the pressure of the neoprene ring against the tubing.

The ends of the fitting are provided with a clamp which is tightened around the tubing or pipe by means of an Allen head screw. As fluid pressure increases the hinging tendency of the clamp exerts a pinching action, jamming the tubing in the clamp in such a manner that it is impossible for the tubing to work free of the fitting while pressure exists.

This fitting is suitable only for positive pressure systems and will not operate satisfactorily under vacuum.

Quikupl fittings are available in sizes in the ranges of 1 in. O.D. tubing to 4 in. I.P.S. pipe. Either Type 304 or 316 stainless steel can be furnished. All fittings are tested under water at two air pressures—5 and 100 psi., using tubing with the loosest commercial fit for the particular size fitting.—*Cooper Alloy Foundry Co., Hillside, N. J.*



Batching Meter Delivers Pre-Set Amount

Delivery to processes or batching operations of a pre-set weight or volume of liquid is offered by a new Neptune Auto-Stop meter. This device is said to save ingredients and insure precise formula make-up, producing uniform product quality and eliminating spoiled batches.

The unit consists of a Model 432 Auto-Stop register mounted on a Type S disk meter. A quick-closing valve is coupled to the register. When the required amount of material has been delivered the quick-closing valve is automatically closed by the meter.

Included in the unit is a totalizer providing cumulative totals on the material metered, permitting daily, weekly or monthly production figures to be recorded.

Although the meter is automatic, flow can be stopped instantly at any time by pressing an emergency stop button. This does not affect the meter reading or the auto-stop setting. Delivery can be continued to its conclusion by re-opening the valves, or the register can be reset for a new quantity before continuing.

The meter should not be used for liquids corrosive to bronze or for food products where copper pick-up is not desirable.

The new meter is available in 1 in., 1½ in. or 2 in. sizes with capacities from 5 to 100 gpm., depending on the size of the meter, the liquid to be handled and the maximum temperature. Adjustment is provided for calibrating the meter on the job.—*Neptune Meter Co., 50 West 50th St., New York 20, N. Y.*

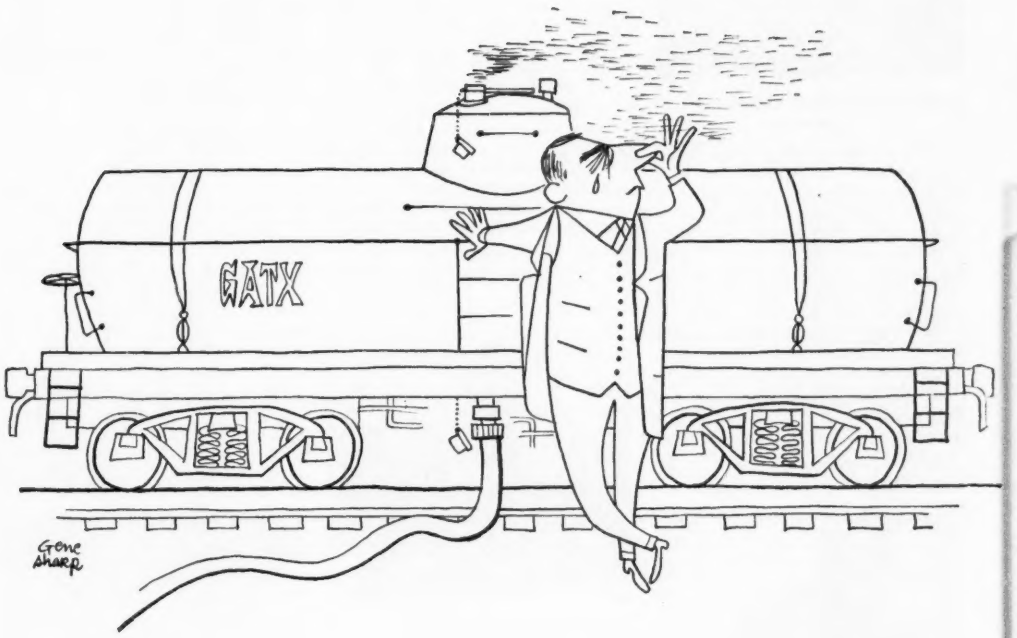
Diaphragm Control Valve Is Easily Maintained

A double-seated diaphragm regulating valve with standard features heretofore obtainable only in expensive specially designed valves is now available. Among the body design features is the provision for ISA standard face-to-face dimensions with high capacity, low turbulence and pressure drop. The valve has renewable interchangeable seat rings that can be removed and replaced without removing the valve body from the pipeline. Seat rings are furnished with Stellited seating surfaces as standard.

Superstructure of the new Class DV valve is rugged and compact, with a cast iron housing for the diaphragm and with a stem accurately machined and guided by an Oilite bushing. This assures precise accurate response to instrument air pressure.

Available sizes range from 1½ to 10 in. for pressures up to 600 psi. All sizes can be furnished with flanged ends, but only the 1½- and 2-in. sizes are available with screwed ends.—*Leslie Co., 306 Delafield Ave., Lyndhurst, N. J.*

THE CARE AND NURSING OF TANK CARS



When unloading toxic chemicals, keep a gas mask handy.

Another way to get more from your GATX tank cars

GATX GENERAL AMERICAN TRADE MARK

GENERAL AMERICAN TRANSPORTATION CORPORATION
135 South La Salle Street • Chicago 90, Illinois

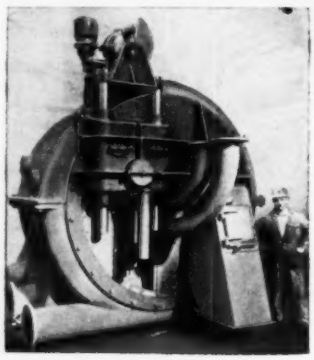
District Offices: Buffalo • Cleveland • Dallas • Houston • Los Angeles • New Orleans
New York • Pittsburgh • St. Louis • San Francisco • Seattle • Tulsa • Washington
Export Dept.: 10 East 49th Street, New York 17, New York

So many people have requested reprints of these cartoon advertisements that we are making them available to you for use in your shops. Just write us.

Teflon Sheets and Tapes Are Now Perforated

Teflon, which is impervious to all acids, alkalis and solvents, is now available in perforated sheets and tapes for use in filtering and sifting separations. Tape thicknesses range from 0.005 in. to 0.050 in. in continuous lengths 12 in. wide. Perforations vary in size from 0.020 in. to 0.062 in., and from 74 to 952 holes per sq. in.

All sheets are available in pieces 24 × 24 in. square. Those with thicknesses of $\frac{1}{32}$ in. and $\frac{1}{16}$ in. can be furnished with 0.033-in. holes and larger. Sheets $\frac{1}{8}$ in. and thicker are perforated with 0.045-in. holes minimum size.—*United States Gasket Co., Camden, N. J.*



Dutch Centrifugal Has U. S. Distributor

Reineveld centrifugals, with a long-standing record of use in European chemical plants, are now available through a domestic distributor. Belonging to the horizontally mounted automatic-batch category, these centrifugals are claimed to feature short operating cycles at high rotational speeds while producing very dry dewatered solids.

High rotational speed is allowable because the main bearing supporting the drum is located at the center of gravity of the rotating mass. This is said to permit a high critical rotational speed free from vibration. Centrifugal forces up to 1,500 times the force of gravity are, therefore, entirely practical in regular operation.

A controlled method of feeding is used to classify the solid particles as the filter bed forms, thereby securing rapid drainage. Together with the high machine speed, this shortens the filtration cycle and makes for a drier product.

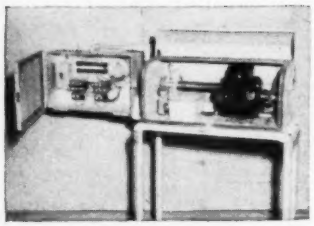
The Reineveld machines are offered in a range of drum sizes from 36 to 80 in. in diameter. Either perforate or imperforate drum construction can be supplied, depending on whether the proposed operation is filtration, separation, or classification. A modified design is available for applications requiring fume-tight construction.—*Heyl and Patterson, Inc., 55 Water St., Pittsburgh 22, Pa.*

Redesigned Centrifugal Saves Time and Labor

A new model of center-slung centrifugal for the chemical processing industries, Model IBI, can handle unbalanced loads three to four times greater than previous models. This means that less care is needed in loading the machine and fewer stops are required to redistribute the load.

Other improvements include mounting the spindle in roller and double-row ball bearings in a new type of tubular housing, a slanting case bottom for faster, more complete drainage, a new self-energizing brake and a motor mounting which is more compact.

Machines are available with split cover or full cover and can be made fume-tight. Basket, case and cover can be constructed of any practicable material as specified. Single-speed or two-speed motor drives, or infinitely variable-speed hydraulic drives are available. Basket sizes are 12 in. through 108 in.—*Tolhurst Centrifugals Div., American Machine and Metals, Inc., E. Moline, Illinois.*

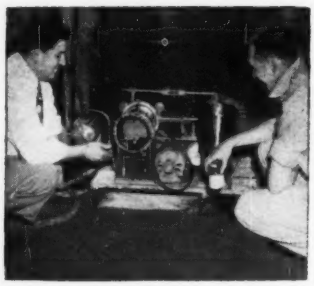


Automatic Sampler Has 12-In. Stroke

The Geary-Jennings automatic sampling machine is now available in a junior model, with a 12-in. stroke, to meet the need for a compact inexpensive unit for small tonnage plants.

The sampler takes a right angle cut of an entire process stream, part of the time, thus getting equal percentages from all parts of the stream. The interval between cuts is constant; by means of timer control, cuts can be made as frequently as necessary.

The new model is provided as a package unit, complete with electrical equipment. Control box can be located at any convenient remote location.—*The Galigher Co., 545 W. 8th South St., Salt Lake City, Utah.*



Miniature Filter Duplicates Large Units

A new miniature pressure-leaf filter is an exact duplicate of production size units. The manufacturer says that use of this model for studying filtration problems provides accurate results for selecting a production size unit.

Included with the unit pictured above are the pump, pre-coat mixing tank, and a quick-opening door. Filtration tests can be carried out by drawing product directly from a feed tank or cutting the test filter into a bypass on a main production line. All steps of the filtration cycle can be studied from pre-coating through the filtration part of the cycle and finally to discharging the filter cake.—*Hercules Filter Corp., Paterson, N. J.*

cut the high cost of corrosion

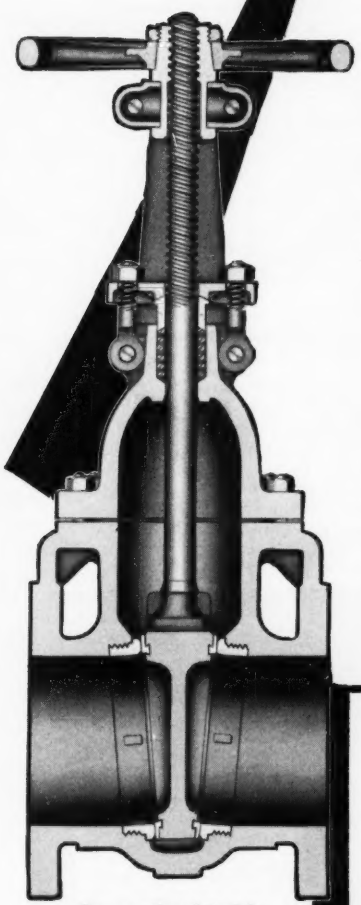
IN MANY SERVICES...WITH

CRANE *Ni-Resist*

CAST IRON GATE VALVES

Here is a line of "cast iron" gate valves with a special talent for resisting corrosion, erosion and wear. Use them with safety where the strength of ordinary cast iron is adequate—in soda and sulfate pulp mill service—on creosote lines in wood treating processes—for handling sour distillates and crudes in petroleum refining—and many similar services.

Clue to the extra staying-power of Crane Ni-Resist Cast Iron Valves is in their make-up (approximately 14% nickel, 2½% chromium, and 6% copper)—and in their 18-8 Mo Alloy Steel stem and seating faces. Not to be overlooked is the fine Crane design that gives you a strong body and bonnet without excessive weight, a well-proportioned stem with precision-cut threads, a sturdy yoke, and the dependable Disc-stem connection that assures smooth operation and tight seating of the solid wedge disc. Ask your Crane representative for full details, or see your Crane Catalog.

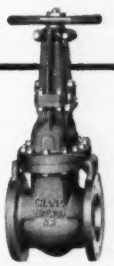


Cross-section 4 to 8 in. sizes; bolted bonnet joint; flanged ends.

THE CRANE NI-RESIST LINE

Working Pressures:
Cold Water, Oil, or Gas, Non-shock
Screwed Valves—225 pounds
Flanged Valves—200 pounds

Available in sizes ½ to 8 in. All have solid wedge disc, with outside screw and yoke. Sizes ½ to 3 in. have clamp type bonnet joint and one-piece bolted gland. Sizes 4 to 8 in. have conventional bolted bonnet joint and two-piece bolted gland.



No. 1671 with Bolted Bonnet Joint, Flanged ends only. Sizes 4, 6 and 8 in.

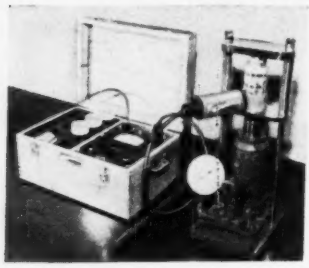
No. 1670 with Clamp Type Bonnet Joint with screwed ends. Sizes ½ to 2 in. Also with flanged ends 1 to 3 in.

***The Complete Crane Line Meets All Valve Needs. That's Why* More Crane Valves Are Used Than Any Other Make!**

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING



Moisture Tester Is Fast, Versatile

Moisture testing of non-metallic granular or powdered materials will be aided by a new moisture tester, Model G5. This new unit eliminates the necessity for sample weighing and provides means for measuring moisture over a wide range.

Four separate units make up the instrument. These consist of a master measuring unit, an interchangeable range box, a sampling unit consisting of electrode and sample cup, and a hydraulic press complete with pressure gage. The master measuring unit remains the same for all applications but the other three units can be interchanged when necessary to test a wide variety of materials or moisture ranges.

The sample to be tested is placed in the sample cup, then compressed with the 5-ton hydraulic press to a predetermined pressure. Then by plugging in the range box at the base of the measuring cup, the moisture content of the material can be instantly read on a microammeter located on the master measuring unit.

Either battery power supply or voltage-regulated line supply can be used with this instrument. Only 10 w. of power are required to run the tester.—*Moisture Register Co., Alhambra, Calif.*

Temperature Regulator Gives Precise Control

Exact temperature control and absolutely dependable performance in continuous unattended service are claimed for the new Electron-o-therm precision temperature controller. Employing a resistance thermometer regulator in conjunction with a precision bridge circuit and a very sensitive vacuum tube amplifier, this instrument can regulate within 0.001 deg. C. over a temperature range from −30 to +225 deg. C.

The instrument is designed for precision temperature control of constant temperature baths used for refractometers, viscosimeters and pyrometers. Other uses are in controlling temperatures of ovens, furnaces and related thermal equipment.

Advantages claimed for this unit are inherent in its construction; there are no moving parts. This in turn means that the original precision and reliability of the instrument are retained indefinitely.

Heat-resistant glass hermetically seals the resistance thermometer. An enclosed mercury-to-mercury plunger type relay actuates the heater load circuit. Special transformer construction insures exceptionally low flux leakage.—*Technical Equipment Co., 4348 San Pablo Ave., Emeryville 8, Calif.*

Radiation Recorder Works on Atomic Energy

A new model of the atomic battery, Model RT, is designed for connection with an electronic recorder so that it may be used for monitoring continuous processes where gamma ray activity is present. This device differs from conventional radiation measuring instruments in that no high-voltage supply is necessary—the radiation received by the cell is converted into an output current proportional to the amount of radiation.

With the recording or indicating instrument, signal contacts may be included to sound high or low alarms, or pneumatically or electrically operated control mechanisms may be employed for automatic process control.—*Ohmart Corp., 2347 Ferguson Road, Cincinnati 38, Ohio.*

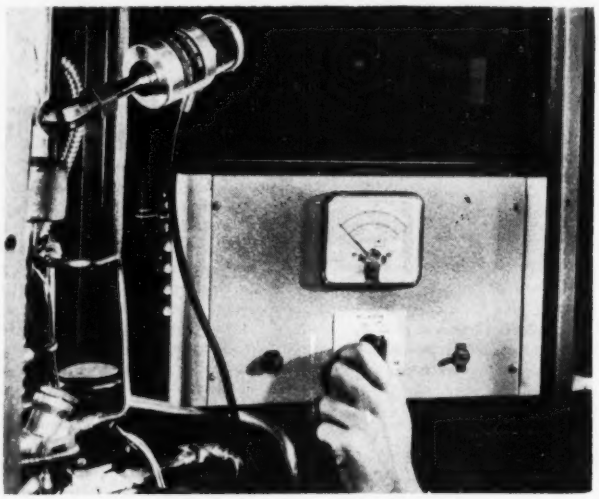
Pressure Transmitter Uses a Vibrating Wire

The Digitran, a new pressure transmitter for ranges from 0 to 3 psi. absolute to 5,000 psi., uses the magnetic field vibrating wire principle to generate a frequency output variable with pressure. The stable frequency output can be counted for a specified period of time and a digital number provided in an electronic counter equal to the pressure experienced.—*Wright Engineering Co., 180 E. California St., Pasadena 1, Cal.*

Moisture Balance Is Fast, Accurate

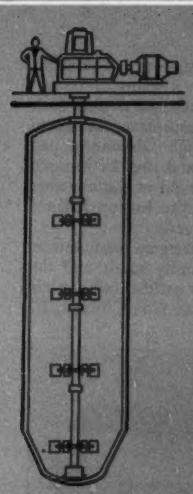
A new instrument for making rapid moisture determinations employs infrared radiation for drying the sample. It is said that precise determination of the moisture content in a wide variety of commodities can be attained in from 5 to 15 min.

Basically, the instrument is a combination of a highly sensitive torsion



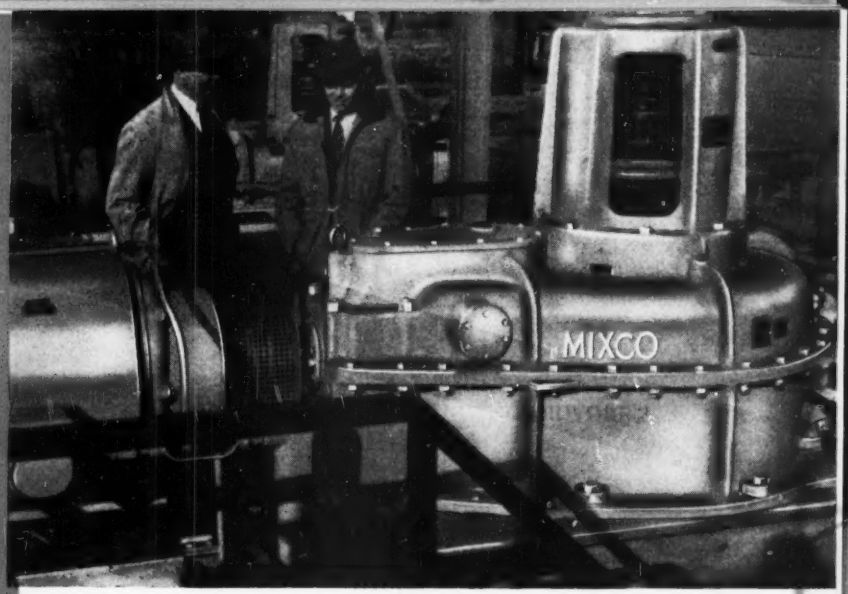
NEW VACUUM GAGE COVERS 8,000,000 TO 1 RANGE

Vacuum measurements by this all-metal pick-up tube and amplifier cover a range of vacuums from .050 mm. to 10^{-7} mm. Hg. Tube works on the glow discharge principle. Permanent magnets, external to the ionization chamber, produce high ionization. Distillation Products Industry Div., Eastman Kodak Co., Rochester 4, N. Y.



NO INTERMEDIATE BEARINGS needed to support the 47-foot mixer shaft. Flex-protected gear reducer quill permits using shaft with bottom steady bearing only. Shaft is in 10-foot sections for easy handling, installation. Alignment is insured by rigid flanged couplings with close-tolerance machined rabbet fits.

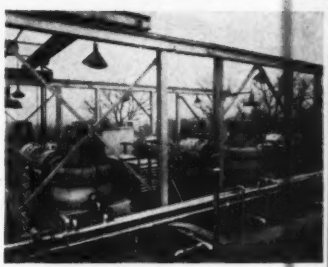
BIG TURBINES are split to pass through 18-inch tank opening and save special tank construction. Steady bearing is split too. Stainless turbines are standard bolted construction, with discs drilled so blades can be removed or added to suit process conditions. Adding blades results in a stepwise increase in HP level.



Big mixing job costs less with *Lightnin®* Mixers

Here's an unusual mixing problem solved with *standard* equipment . . . six 200-HP LIGHTNIN Mixers dispersing air for antibiotic fermentation in 25,000-gallon tanks at Commercial Solvents Corporation, Terre Haute, Ind.

It shows how MIXCO engineers can adapt *standard* LIGHTNIN Mixers to a *custom* processing job, and save you money. Your LIGHTNIN Mixer representative will be glad to assist you with your fluid mixing requirements—or write us direct. For catalog information about LIGHTNIN Mixers check and mail the coupon.



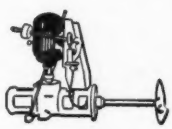
SUBSTANTIAL SAVINGS come from using *standard* equipment on big mixing jobs, like this battery of LIGHTNIN Mixers at a Commercial Solvents Corporation plant.

MIXCO

fluid mixing specialists

EVERY *LIGHTNIN* MIXER IS GUARANTEED TO DO THE JOB *RIGHT*

PORTABLE
½ to 3 HP



SIDE ENTERING
1 to 25 HP

TOP ENTERING
¼ to 800 HP

MIXING EQUIPMENT Co., Inc.

128 Mt. Read Blvd., Rochester 11, N. Y.

In Canada: William & J. G. Greey, Ltd., Toronto

Please send me the bulletins checked:

- ☐ B-102 Top Entering Mixers (turbine and paddle types)
- ☐ B-100 Condensed Catalog (complete line)
- ☐ B-78 Top Entering Mixers (propeller type)
- ☐ B-75 Portable Mixers (electric and air driven)
- ☐ B-76 Side Entering Mixers
- ☐ DH-50 Laboratory Mixers

Name_____

Title_____

Company_____

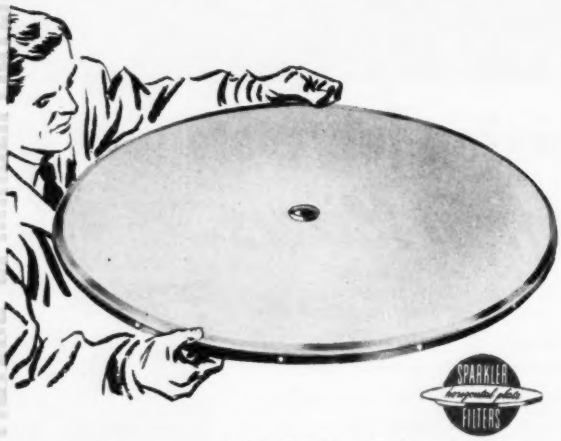
Address_____

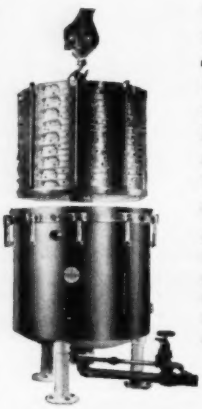
City_____ Zone____ State_____

SPARKLER FILTERS · SPARKLER FILTERS

SPARKLER FILTERS

Designed to use diatomaceous earth without the necessity of a fibrous material pre-coat to hold cake on the plate.





With Sparkler horizontal plates there is no tensile strain on the cake. Even a very thin cake can be built up without danger of slipping or breaking as it rests in a horizontal position on the plate and requires no pressure to hold it in position. This saves considerable cost in pre-coating.

Sparkler horizontal filter plates can be removed for cleaning in one unit assembly and a clean set lowered into the filter tank immediately. This feature reduces down time to a matter of minutes.

Representatives in all principal cities in the U.S.A.

SPARKLER MANUFACTURING CO.
Mundelein, Ill.

Sparkler International Ltd.
Herengraht 568, Amsterdam, Holland

Sparkler Western Hemisphere Corp.
Mundelein, Ill., U. S. A.

balance and an infrared drying unit. Five grams of a sample to be tested are placed in a light aluminum pan inside the unit for drying by infrared radiation. The weight of the moisture loss is shown by the torsion balance on the calibrated scale.

Such widely divergent materials as cereal grains, foundry sands and detergents can all be satisfactorily tested. —*Central Scientific Co., Chicago, Ill.*

Differential Colorimeter More Accurate Than The Eye

The Colormaster differential colorimeter is a recently developed instrument for obtaining accurate color measurements of dyes, pigments, paints, textiles, etc. It is said to have a system sensitivity appreciably greater than the eye can discern, being particularly useful for measuring differences between similar colors for process control applications.

A complete set of color measurements can be made with the Colormaster in less than 30 sec., it is claimed. Simple to operate, results are taken directly from a dial which can be read to 0.1 percent.

Linearity of the instrument is within approximately 0.2 percent reflectance or transmission down to 10 percent; by standardizing on a known dark panel, the range can be extended far below 10 percent, with linearity within approximately 0.02 percent.—*Manufacturers Engineering & Equipment Corp., Hatboro, Pa.*

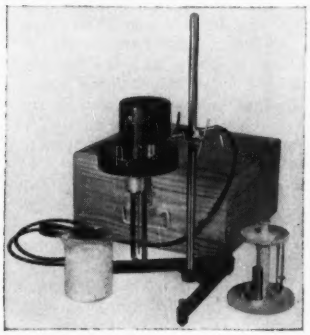
Hand Tachometer Covers Wide Speed Range

Determination of machine speeds is simplified when using the O-Z universal hand tachometer. Lengthening of the speed range scales has halved the number of steps required to cover a range from 25 rpm. to 30,000 rpm.

Heart of this development is a new patented cross pendulum which operates on the centrifugal governor principal. This has made it possible to open up the scale on the face of the

tachometer, permitting the knife edge hand to make almost two complete turns for each speed range.

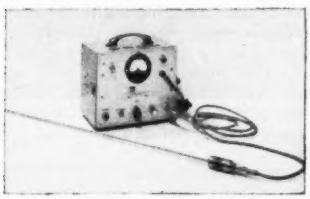
Also included in the instrument is a light wind vane damping mechanism which eliminates all vibration of the indicator without slowing the indication of speed or speed variation.—*O. Zernickow Co., 16 Park Row, New York 7, N. Y.*



Viscosity Meter Covers Wide Range

Featuring a 200 to 1 ratio of speeds, starting at 0.3 rpm., the new Model LVT Synchro-Lectric viscosimeter covers a wide range of viscosity. When equipped with a UL adapter, it can measure any viscosity between 0.5 and 2,000,000 cp.

Several other new Synchro-Lectric models have also been recently introduced. All models now have a new bubble level permanently attached to the instrument for proper leveling either in a laboratory stand or when making field measurements. Another important feature is that any standard model now may be had in explosion-proof construction.—*Brookfield Engineering Laboratories, Inc., Porter St., Stoughton, Mass.*



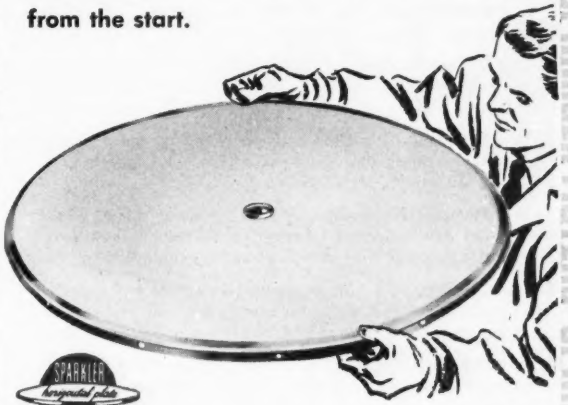
Combustion Zones Can Now Be Explored

Studies of combustion and flame propagation will be aided by a new instrument designed to detect, amplify and indicate electrical signals in the audio frequency range which are generated by turbulent flames. Al-

SPARKLER FILTERS · SPARKLER FILTERS

SPARKLER FILTERS

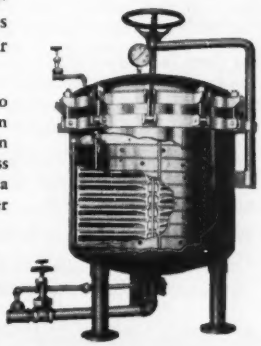
Designed for maximum pre-coat economy. Only a thin pre-coat cake is necessary to assure brilliant clarity of the filtrate right from the start.



SPARKLER horizontal plate FILTERS

Sparkler horizontal plates permit the filter media to be floated onto the plate and deposited with gravity into a cake of uniform thickness and uniform density even though the first pre-coat is very thin. This saves considerable time and Filter Aid in pre-coating.

Since no pressure is needed to hold this thin pre-coat cake in position it is possible to begin filtering operation with less pressure which results in a cake of less density and greater flow rate.



For personal service on your filtering problems, address correspondence to Mr. Eric Anderson

SPARKLER MANUFACTURING CO.
Mundelein, Ill.

Sparkler International Ltd.
Herengracht 568, Amsterdam, Holland

Sparkler Western Hemisphere Corp.
Mundelein, Ill., U. S. A.

SPARKLER FILTERS · SPARKLER FILTERS

CONFIRMING SLY AS PIONEERS and LEADERS IN INDUSTRIAL DUST CONTROL

one of our men from the Cleveland office visited 9 nearby installations and here is what he found:

1. In a Cement Plant—This Sly filter is responsible for saving approximately $100, or 50 barrels of cement, per 24-hour day.

2. In a Refractory Plant—Two Sly filters are salvaging refractories fines, which are returned to the mixing of their product, at the rate of 3300 lbs. per day at a value of $10.00 per ton.

3. In a Steel Mill—The filter is performing very satisfactorily and user is surprised that the bags do not need replacement since hot mill scale is very abrasive.

4. In a Stamping Plant—The Sly units are doing a very effective job of dust suppression throughout the plant. They have operated 4½ years without repairs or bag replacement.

5. In a Soy Bean Mill—The company takes pride in the cleanliness of the plant and enjoys the savings from the recovery of 5½ tons of meal at a value of $74.00 per ton, or $407, per day.

6. In a Foundry—Since the installation of these filters the company has not replaced any bags, including the first unit, which is still going strong after 13 years. The maintenance has been nil, and the performance very satisfactory.

7. In a Processing Plant—Well pleased, and maintenance nil. Dust collection produces better looking products.

8. In a Rubber Plant—Sly filter collects mica from covering machine and zinc stearate from dusting, which are constantly re-used. Very satisfactory service and up to date no repairs.

9. In a Soap Factory—Filter is doing a splendid job of collection, and soap fines are returned to product. Has operated for a period of 4½ years without bag replacement or repairs.

By 100% dust collection and economical operation, Sly Dust Filters soon repay their cost. They collect practically all kinds of industrial dusts.

We are both losing money as long as you don't use Sly.

Tell us your dust problem, we'll tell you what can be done and send you helpful Bulletin 98 on dust collection.

THE W. W. SLY MANUFACTURING CO.

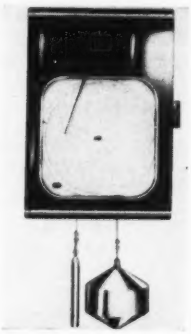
4771 TRAIN AVENUE • CLEVELAND 2, OHIO

BRANCHES IN: New York • Chicago • Philadelphia • Syracuse
Detroit • Buffalo • Cincinnati • St. Louis • Minneapolis • Birmingham
Los Angeles • Toronto

though this instrument, the Phillips 66 Flamometer, is still in the experimental stage it is expected to be an excellent tool for locating flame boundaries.

The instrument consists of a detector probe and an amplifier. Signals from the probe are fed through the amplifier, which has a gain control; this allows the instrument to be used on different types of flames. However, no significant signal is registered unless the probe is in an actual ionized, turbulent flame zone. Signal detection is not materially affected by the temperature of the detecting tip.

Amplifier output can be observed or used in the following manner: (1) The output can be read directly from the meter on the panel; (2) the output can drive a 0-1 ma. pen recorder; (3) the signal can be followed on an oscilloscope; or (4) the output can be used to actuate relays or a thermal mechanism.—*Phillips Petroleum Co., Instrument Div., Bartlesville, Okla.*



Flow Meters For Open Channels

The new Series 500 open channel flow meters are designed for measuring, recording and controlling the flow of water, sewage and industrial wastes. Flow is determined by measuring the head of liquid flowing through a flume or over a weir in the flow channel. This measurement of head is converted by means of a cam into terms of flow, which is then recorded on a uniform chart and integrated if desired.

Superseding the older Model 40M line, the new meters are offered in both mechanical and electrical versions. With the latter type, the record can be made at any distance from the point of measurement.

Cams can be cut to provide uniform charts for any of the various weir plates in general use, such as V-notch, trapezoidal, Cipoletti or rectangular. —*Bristol Co., Waterbury, Conn.*

Yes, We Have a BACKLOG... a *Big* One!!!

But Our Greatest Backlog is EXPERIENCE

And our Plant has sprouted two new "wings" to Speed Delivery of MIKROS To Customers in the Process Industries

We have spent more than a quarter century building up that precious backlog of experience. During these active years we have devoted every hour of every working day to a single problem. And that problem is *your* problem if it involves grinding, blending or dust collection.

We have spent a minimum of 300,000 engineering and research hours seeing to it that our customers get precisely what they need—which actually means anticipating their need for improved MIKRO equipment to do an ever better job in pulverizing, liquid or dry milling, blending and industrial dust control.

Twenty-eight years on one job add up to a lot of savvy, but they don't necessarily mean hardened arteries or long whiskers. A man is still quite young at 28—and so is an industrial organization if it has dynamic enthusiasm.

We haven't stopped growing by a long shot. Only recently we added 25% to our production stature; our plant has sprouted two new wings so that we will be ready to fly at any new job you hand to us.

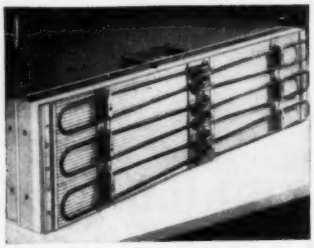
It won't cost you anything to test our seasoned youth. If you have a grinding or dust collection problem you can't seem to lick, let our MIKRO Laboratory work on it. And by all means, drop us a line if you want the know-how.

PULVERIZING MACHINERY COMPANY
55 Chatham Road Summit, New Jersey

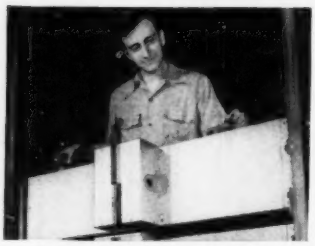
PRESERVE OUR HERITAGE: FAITH, FREEDOM AND INCENTIVE

MIKRO-PULVERIZER (FINE)
MIKRO-ATOMIZER (ULTRA FINE)
MIKRO-COLLECTOR (100 PER CENT)
REG. U.S. PAT. OFF.

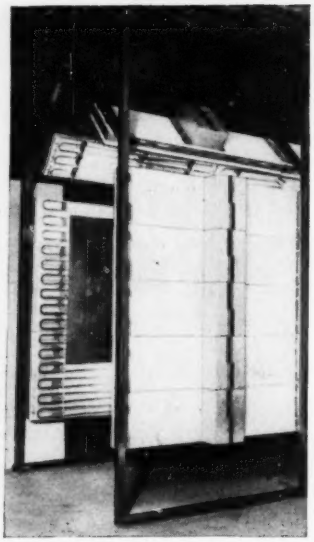
1794



INFRARED radiation panels . . .



MOUNTED on channel frames . . .



ASSEMBLE into complete oven.

Now—Pre-Fab Oven Panels

These infrared heating panels, complete with wiring, assemble into ovens for working temperatures up to 700 deg. F.

Heating ovens using far infrared energy can now be built quickly, easily and economically, using pre-fabricated panels. These panels, complete with built-in bus bars, insulation and frame, are supplied ready to be erected in oven structures and connected to plant wiring.

The panels have an output in excess of 9,200 Btu. per sq. ft. per hr., said to be higher than any other infrared equipment operating in the temperature range below 700 deg. F. Radiation can be controlled from 4 percent to 100 percent of capacity, thus providing a wide working temperature range.

Available in sizes of 1 ft. × 4 ft. and 2 ft. × 4 ft., the panels can be assembled into ovens of almost any length, width or height. They may be rearranged to fit the work size or readily knocked down and moved to other locations.

As seen in the above picture, the panel is constructed of totally enclosed alloy-sheathed heating elements mounted on a rigid panel section. Panel construction features five-ply built-in thermal insulation with air space between layers. The structural frame is welded steel, giving a rigid self-supporting unit. Built-in mounting angles requiring only four bolts per panel facilitate erection.

Built-in bus bars on the back of the panel allow connecting as many as seven adjacent panels in parallel with only one power supply connection. The fully enclosed continuous bus has 100 amp. capacity per line and can be used with single or three-phase power up to 575 v. Copper power supply lines can be used.

The Chromalox elements are said to give an even heating pattern without hot or cold spots; over-all radiation is of unvarying uniformity. Breakage associated with filament-type glass bulb construction is eliminated by the use of the all-metal heating element. The low reflecting characteristic of the far infrared radiation extends the uses of the panel to cover applications involving light colors or transparent materials.

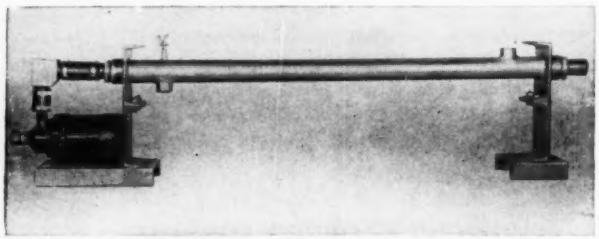
In cases where preheating of air is desired, such air may be forced through the airways in the panel between the insulation layers, thereby making the heating panels serve a dual purpose.—*Edwin L. Wiegand Co., 7514 Thomas Blvd., Pittsburgh 8, Pa.*

External Insulation Makes Vessel An Oven

The internal application to large process vessels of phenolic resin or other protective coatings requiring high temperature baking for curing now becomes practical through the use of insulating coating on the outside of the vessel. This coating consists of vermiculite high-temperature cement blown onto the outside of the vessel from a gun. The resin coating may then be applied to the inside surfaces and baked on, using an open flame from a propane gas burner.

In all applications to date the insulation layer of vermiculite cement has been removed after the job is finished. However, it could probably be left on if so desired.

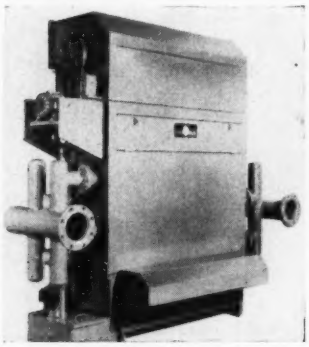
Use of this method cuts fuel costs,



DOUBLE PIPE EXCHANGER HEATS OR COOLS CORROSIVES

This No. 1251 heat exchanger has been developed specifically for corrosive chemical solutions. Tube materials for standard units can be impervious graphite, nickel, stainless steel, carbon steel or Carpenter 20. Exchanger is engineered in a wide variety of complete package units.—Heil Process Equipment Corp., 12901 Elmwood Ave., Cleveland 11, Ohio.

reduces baking time and makes possible wider use of protective coatings, it is said. The vermiculite cement costs about 15c. per sq. ft. applied.—*Zonolite Co., 135 S. LaSalle St., Chicago 3, Ill.*



Gas Aftercooler Has Increased Capacity

An improved design Aero aftercooler has resulted in boosting cooling capacity from 25 percent to 75 percent over previous models.

Cooling is done by the evaporation of recirculating water sprays on the surface of tubes through which compressed gases or air passes. The increased capacity in the new models is gained by improved distribution of the compressed air in the machine and by an increase in the amount of evaporating surface. Tube sizes have also been increased to reduce friction.

It is said that this type of aftercooler removes more moisture from the air or gas than aftercoolers using surface cooling. Since the compressed air is always cooled below the atmospheric dry bulb temperature it reduces condensation in compressed air lines and damage to pneumatic tools, paint sprays and plant processes.—*Niagara Blower Co., 405 Lexington Ave., New York 17, N. Y.*

Cooling System Minimizes Water Use

A new type cooling system integrated for all process plant cooling services combines the economical maximum use of air with minimum use of water. The unit is so designed that air cooling is used for total heat dissipation in all services. However, when high ambient air temperature prevents air cooling to the desired temperature the air is first cooled to near the wet bulb temperature by being drawn through water in the cooling tower section of the unit. During periods of low ambient temperature the inlet air is used directly in the air-

DARCO® G-60

filters three times faster than ordinary carbons!

UNDER COMPARABLE CONDITIONS, Darco G-60 has a filtration rate three to four times that of ordinary carbons! This means cost-cutting acceleration of the step which is so often a costly bottleneck in a process—filtration.

Maximum filterability is only one feature of Darco G-60, the activated carbon of *premium* purity. It also gives you the ideal combination of high adsorptive capacity and low retention loss—plus freedom from extractable contaminants.

Write for the complete story and a sample of this outstanding carbon today.

IMAGINUITY AT WORK

Here's a trick worth trying! To remove trace metals from plasticizers and other water-immiscible liquids: Shake liquid with small amount of water. Separate excess water, then treat liquid with about 1% Darco G-60. This will remove the haze of emulsified water together with the trace metal that has been transferred to the water phase.

DARCO G-60

Highest purity... by the gram or carload

DARCO

DARCO DEPARTMENT
ATLAS POWDER COMPANY
Darco General Sales Offices
60 East 42nd Street, New York 17, N. Y.

ATLAS POWDER COMPANY, CANADA, LTD., BRANTFORD, CANADA

Koppers Resorcinol
decontrolled by N. P. A.

Available Now...for unlimited use

RESORCINOL, under National Production Authority allocation since June 1, 1951, has been released entirely from government control.

This means that you can order Koppers Resorcinol NOW for all defense and civilian uses.

To further augment the available supply of Resorcinol, Koppers will put new plant facilities into operation by the third quarter of this year.

Resorcinol is a very interesting chemical—worth your consideration. Typical end products are explosives, medicinals, dyestuffs, adhesives, textile and leather chemicals and compounds that make rubber adhere better to fabrics and cords. The versatile nature of Resorcinol stems from its many unusual reactions. These are worth investigating and may suggest new and undeveloped commercial applications.

Koppers Resorcinol is manufactured in two grades. Koppers Resorcinol, Technical, is produced in flake form with a minimum purity of 98.5%. Koppers Resorcinol, U.S.P., for medicinal and pharmaceutical applications, is in the form of fine crystals with a minimum purity of 99.5%.

A request on your letterhead will bring you complete information on Resorcinol as well as an experimental sample. Ask for Bulletin C-2-124. It describes many of the interesting and unusual reactions of Resorcinol, as well as its physical properties, chemical properties and uses.

KOPPERS

KOPPERS COMPANY, INC.
Chemical Division, Dept. CE-7
Koppers Building, Pittsburgh 19, Pa.

cooled exchangers and no water is evaporated in the cooling tower.

This unit, known as the Combinaire, is now available following two years of development and test work carried out on a large West Texas installation.—*Hudson Engineering Corp., Fairview Sta., Houston, Tex.*

Combination Burner Makes Instant Changes

The Fyr-Matic, a newly developed combination gas-oil burner, is designed for use where both oil and gas are available and interchangeable. Flick of a switch changes from one fuel to the other instantly and automatically. Use of this burner makes possible the alternation of fuels according to availability or economy.

Fuel gases of 800 to 3,200 Btu. ratings or No. 1, 2 or 3 fuel oil may be used, all operating with equal efficiency, it is claimed. No induced secondary air is necessary, as the burner is designed to furnish its own air for complete combustion. Positive ignition is assured by electric spark for oil and an interlocked gas pilot for gas fuel.

Other features are dual atomization, rotary flame action, compact design and electronic flame failure control.—*Eclipse Fuel Engineering Co., 1121 Buchanan St., Rockford, Ill.*

Oven Air Circulation Varies Automatically

A new laboratory drying oven features constant-weight air circulation by automatically increasing volume circulation with rising temperature. It is said that this gives improved drying performance with better temperature control and uniformity.

Variation in the volume of air flow is attained by a heat-sensitive damper in the air duct. A larger-than-conventional blower wheel on the constant speed motor provides the larger volume circulation required at elevated temperatures. This is said to be achieved without increasing motor horsepower.—*Blue "M" Electric Co., Chicago 21, Ill.*

They're DROP FORGED

of STEEL...

W-S Screw-End and Socket-Weld Fittings

There are several big benefits to you implied in this simple statement of fact about W-S Fittings.

First, forging means *strength*—the strongest, most compact physical form, steel for steel, obtainable by commercial methods of fabrication.

Second, *being* stronger, forged fittings are much *smaller* and *lighter*, size for size, than other types.

Third, *dimensional accuracy* is characteristic of the forging process—and because forged bodies *are* more accurate, they chuck better, can be machined to *closer*, more *uniform tolerances* than other types.

To these inherent advantages of *forged* fittings, add Watson-Stillman's modern manufacturing facilities, a production control system that's air-tight from furnace to finished product, and a sales engineering staff dedicated to SERVICE in the largest sense of the word. The total is heavily weighted in favor of the advantages of W-S Double-Diamond Forged Steel Fittings.

• Lower Service Cost • More Uniform
• Stronger • Smaller • Lighter • Tighter

SOLD THROUGH LEADING DISTRIBUTORS . . . EVERYWHERE

WATSON-STILLMAN
ESTABLISHED 1848

W-S

9-M-1

DISTRIBUTOR PRODUCTS DIVISION

ROSELLE, NEW JERSEY

Designers and Manufacturers of Forged Steel Fittings, Wire Rope Shears, Hand Pumps, Jacks, Pipe Benders and Hydraulic Equipment

Oil Moves In Paper-Foil Drums

Multiple-ply laminates of aluminum foil and kraft linerboard make new light-weight oil and grease drums.

Faced with rising container costs and metal shortages, a major West coast company is now shipping oil and grease in laminated drums. Performance records are said to show that these drums either equal or surpass metal containers under the most rugged handling and shipping conditions.

Confirmation of this statement is furnished by results of a 30-day physical test carried out under controlled conditions. Both 5 and 15-gal. drums filled with SAE 10 oil were stacked under loads of 2,000 lb. and 3,000 lb. respectively. Temperature was maintained at 158 deg. F. for the entire period. At the end of the test no failure or leakage was discernible.

In another test air pressure at 46 psi. was held within the drums without loss for 24 hr. Also, in handling commercial shipments these drums have a lower percentage of leakers than conventional steel drums.

Costwise, the light-weight laminated drums show substantial savings. Decreased bookkeeping and reconditioning costs result from one-trip use of 5 and 15-gal. sizes and no more than five-trip use of the 30 and 55-gal. sizes. Net material savings of 4 lb. of steel are realized for every 1.1 lb. of laminate used.

Manufacturing procedure is comparatively simple. Coils of foil and kraft laminates are coated with adhesive and wound convolutely to the required size and thickness. In the 5-gal. size this requires six plies, while in the 15-gal. drum eight plies are necessary. Sheet steel tops and bottoms are attached to the shell by a special patented process. Water-resistant paint is sprayed on the drum exterior by an electrostatic spray method with almost no waste.

In designing the drums, a major problem was overcome in producing a liquid-tight seal rugged enough to withstand harsh handling. The answer was found by laminating the aluminum foil to 16-pt. kraft liner board and forming the container from several plies of the material, instead of trying to use a single layer of foil solely as a liner. Use of the multiple layers provides high strength and gives complete moisture tightness.

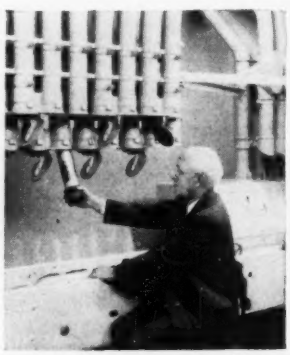
Among the possible future uses for this type container are the packaging of paints, vegetable oils and other liquid and semi-liquid products, as well as granular and powdered products.—*Pacific Steelfibre Drums, Inc., 1025 Westminster Ave., Alhambra, Calif.*

Automatic Conveyor System Empties, Washes Drums

A newly designed fully automatic conveyor system performs the job of drum emptying, washing, and blowing them dry at the rate of 40 drums per hr. The entire operation is done within a dust-tight system.

The system comprises four principal units: (1) A totally enclosed automatic skip hoist that elevates and empties the drum over the receiving hopper; (2) a transfer conveyor that carries the empty drum from the emptying station to the washing station; (3) an automatic drum washing station; (4) a Lowerator for dropping the empty clean drum to the discharge point.

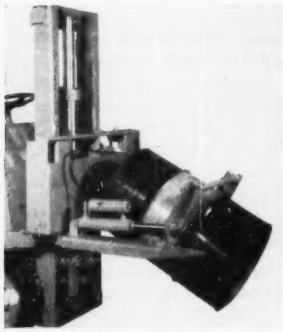
Three chemical plants are already using this equipment, which cuts down



PNEUMATIC TUBES CARRY SAMPLES TO LABORATORY

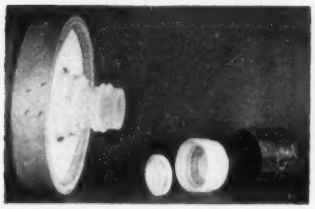
Test samples of all kinds flow via pneumatic tubes from various parts of Upjohn's new Kalamazoo plant to the central dispatching station on the left. The dispatcher then routes each container to its proper destination, as with the sample which the laboratory man is receiving on the right.—Lamson Corp., Syracuse, N. Y.

on manual lifting. Other types of processing plants may easily adapt it to their operations.—*Gilford-Wood Co., Hudson, N. Y.*



Hydraulic Drum Up-Ender Attaches to Fork Truck

A new hydraulic drum up-ender attachment permits a fork truck operator to pick up, transport, stack and empty heavy drums without leaving his seat. Drums can be rotated 90 deg. for vertical or horizontal stacking or tilted 45 deg. below horizontal for emptying at any height within the lift range of the truck.—*Baker-Raulang Co., 1250 W. 80th St., Cleveland, Ohio.*



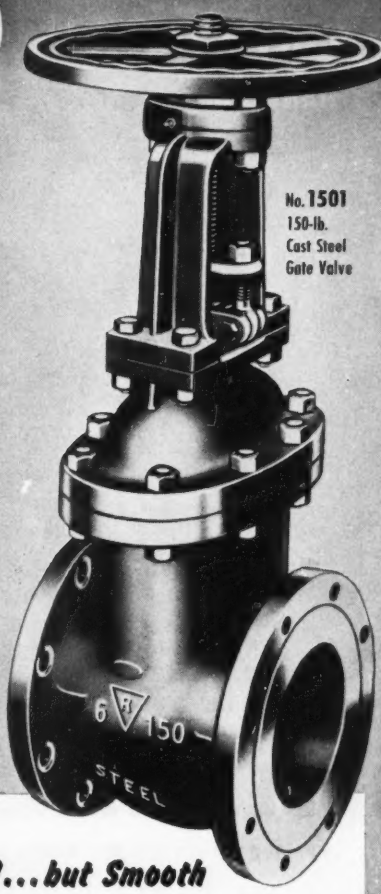
Polyethylene Carboy Is Tough, Light, Resistant

Polyethylene carboys have made their debut as shipping containers for reagent-grade hydrofluoric acid and other fluorine chemicals. Other industrial acids, caustic solution, hydrogen peroxide, liquid pharmaceuticals and photographic solutions are some of the materials that may eventually be packaged in these containers.

The carboy is a blow-molded polyethylene container in either 6½ or 13-gal. size capped by a hard dome-like phenolic resin screw cap that protects the inner polyethylene screw cap and neck. It is jacketed in a round plywood case.

Compared with the standard glass carboy, the polyethylene carboy weighs less than half as much and is less bulky. In addition it is unbreak-

an ACCO product



TOUGH... but Smooth

● Electric furnace steel is used in the manufacture of R-P&C Cast Steel Valves. With all parts of equal strength, they are tough. Bodies resist distortion. One-piece yoke is rigid, provides permanent alignment. Gland packing stays tight at high pressures and temperatures. Requires little servicing. Internal design permits smooth flow and positive shut-off.

You'll save money with R-P&C Cast Steel Gate Valves. See your R-P&C distributor or write the nearest R-P&C district office for information.

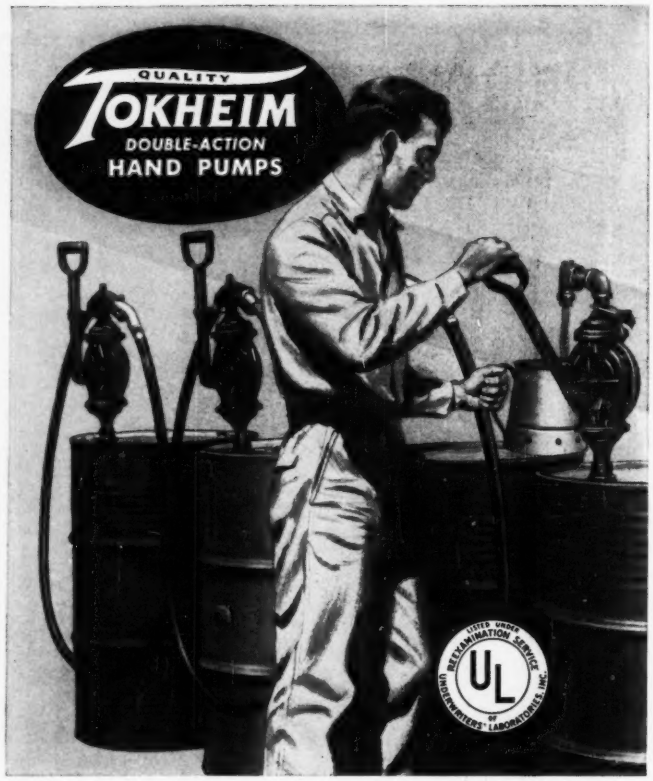
ACCO

R-P&C VALVE DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

Reading, Pa., Atlanta, Baltimore, Boston, Chicago, Denver, Detroit, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

R-P&C valves



SAFER HANDLING

OF PETROLEUM AND SCORES OF OTHER LIQUIDS!

DO YOU NEED A PUMP FOR THESE LIQUIDS?

A Tokheim Will Handle Them All and Others. Tell Us Your Problem!

ACETATES ☐
ALCOHOLS ☐
AROMATIC SOLVENTS ☐
CHLORINATED SOLVENTS ☐
GLYCOLS ☐
KETONES and ETHERS ☐
PETROLEUM SOLVENTS ☐
PLASTICIZERS ☐
PETROLEUM PRODUCTS ☐

For safer, better handling of liquids in plant or field, look to TOKHEIM PUMPS. This new double-action hand pump stops wasteful, dangerous dripping and slippery floors. Reduces fire hazard and accidents common to other methods of transfer. Saves on drum storage space. Speeds production, reduces operating costs. Handles scores of liquids efficiently. Choice of hose and spout models—for drums, skid tanks and underground installations.

Write for literature

General Products Division

TOKHEIM OIL TANK AND PUMP COMPANY

1690 Wabash Avenue, Fort Wayne 1, Indiana

Factory Branch: 1309 Howard Street, San Francisco 3, California

able and chemically resistant, promising long life, safe handling and storage. At present it is priced at about $25.—*Plax Corp., Hartford Conn.*

Giant Belt Conveyor Speeds Coal Transfer

Coal at the rate of 3,000 tons per hr. is being transferred by a belt conveyor from railroad cars to river boats on the Calumet River in Chicago. The belt is fed by a five-car unloading facility. This installation is claimed to be one of the fastest coal unloading stations in the world.

Constructed of seven plies of 42-oz. duck covered with rubber, the belt measures 72 in. wide and 942 ft. long. It was fabricated in two sections and shipped by rail to the unloading installation, where it was assembled. A 350-hp. motor drives the belt at an operating speed of 560 ft. per min.—*United States Rubber Co., Passaic, N. J.*

Steel Strapping Machine Spotwelds Joints

A new power-driven strapping machine produces strap joints by spotwelding. Strapping is applied at a uniform selected tension anywhere in the range up to 750 lb. Strength of the spotwelded joint approaches the tensile strength of the strapping itself.

The unit can be installed in standard conveyor systems, as shown in the above picture. In operation, packages approach the machine on a roller conveyor from the right. After strapping, the packages leave the machine from the left.

Roller sections in the table top of the strapping machine allow turning and positioning of packages over the tensioning and welding units, thereby eliminating the necessity for manual lifting.

After the package has been positioned, the operator's left hand holds

the package in place against the back guide. Feeding of the strap is actuated by a foot pedal and guided by the operator's right hand. When the strapping has been fed around the package, the operator removes his right hand and pushes the control, completing the cycle of tensioning, cutting and welding.

Strapping is fed to the unit from a reel stand holding a 100-lb. coil. Strap widths of ⅜ in., ½ in., ⅝ in. and ¾ in. and thicknesses up to 0.023 in. can be handled in the machine.

Power supply for the welding circuit is 230-v., 60-cycle, single-phase current. The control circuit uses 115-v. current.—*Acme Steel Co., Chicago, Ill.*

Shipping Containers Are Custom Made

Drumpak shipping cartons are now offered as custom-made items to meet the requirements of whatever product is to be shipped. A wide range of carton stock and design modifications can be combined to suit a tremendous variety of products. Where required the carton can be fitted with a moisture-proof liner and a sift-proof seal for top and bottom. Suitable color printing on the outer surface adds to the eye appeal.

The selection of carton stock from tough materials, plus the stiffening effect of the multisided shape and end reinforcing, make Drumpaks unusually rugged, it is said. For savings in shipping expense and storage space the container is shipped flat for assembly at the packaging point.—*Gaylord Container Corp., St. Louis 2, Mo.*

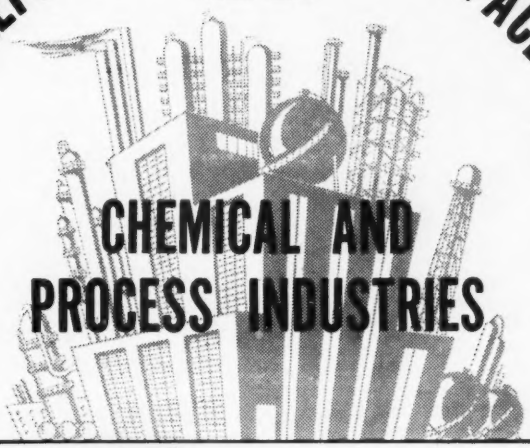
Conveyor Rollers Are Plastic-Covered

A newly developed use for Dekoron plastic-covered metal tubing is in the form of conveyor rollers which are subject to corrosive atmospheres or other severe conditions. The manufacturer claims two main advantages for these rollers:

1. Where corrosive conditions are severe enough to otherwise warrant use of stainless steel, a considerable saving can be effected.

2. Where corrosive conditions, although not severe, might attack the roller surface enough to present a contamination problem, Dekoron will offer a clean, uncontaminated surface.

The Dekoron process involves the extrusion of a coating of plastic over steel tubing. Thickness and composition of the plastic can be varied to suit the requirements, although a semi-rigid vinyl coating approximately $\frac{1}{32}$ in. thick is most often used.—*Samuel Moore & Co., Dekoron Tubing Div., Mantua, Ohio.*

KEEPING CONSTRUCTION PACE
with the

CHEMICAL AND PROCESS INDUSTRIES

1904—Potassium and sodium bichromate plant built at Jersey City, N. J. for Mutual Chemical Company

1939—Largest outdoor boiler plant of its kind at that time, built for Texas Co., at Port Arthur, Tex.

1945—First commercial streptomycin plant, built at Elkton, Va., for Merck & Co.

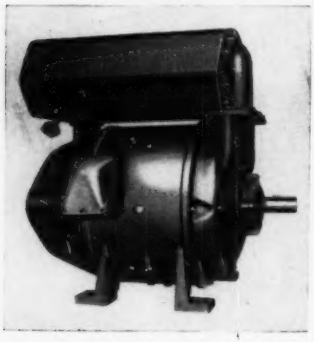
TODAY—Chemical and process plants for General Chemical, Solvay Process, St. Regis Paper Co., National Container Corp., and others

Each new development of "The Chemical Century" brings a fresh construction challenge—a challenge met by Merritt-Chapman & Scott through specialized knowledge of the field, and of the problems involved in translating laboratory research into full scale production.

The M-C&S record of repeat contracts is built on our ability to keep pace with every phase of chemical and process construction, and to deliver projects in minimum time at minimum cost.

Your Confidence is Justified Where This Flag Flies

MERRITT-CHAPMAN & SCOTT
CORPORATION
FOUNDED IN 1860
GENERAL OFFICES:
17 BATTERY PLACE, NEW YORK 4, N. Y.
CLEVELAND • BOSTON • NEW LONDON
DALLAS • NORFOLK • JACKSONVILLE

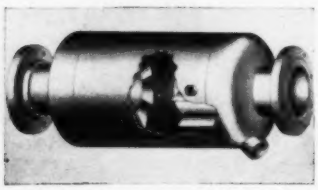


Electric Motor
Has Heat Exchanger

Variable-speed totally enclosed electric motors are now being built with an auxiliary heat exchanger as an integral part of the frame. Increased cooling efficiency thus obtained permits lighter weight for a given horsepower rating in this type of motor. This in turn increases the attainable upper horsepower limit to 150 hp., double the limit previously imposed.

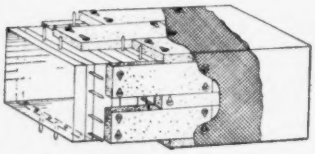
The heat exchanger section is fabricated of cast aluminum with both internal and external fins for maximum heat dissipation. A 1½-hp., 3-phase, 60-cycle motor built into the heat exchanger drives internal and external fans independently of the motor itself. This produces air velocities of 2,900 fpm. through the internal section and 3,300 fpm. over the external fins.

High air velocity over the cooling surfaces tends to keep the surfaces clean, thereby simplifying maintenance. When cleaning is required the wide exposed fins are more readily cleaned than the small tubes used with previous enclosed motor design. —*Reliance Electric and Engineering Co., 1088 Ivanhoe Rd., Cleveland 10, Ohio.*



Entrainment Separator
Fits Into Pipeline

Here is another in the new series of Hi-Ef purifiers—this one is for installation in compressed air, gas, vapor or steam lines. It is made in line sizes from 2½ to 24 in. and in pressure ratings to 600 psi. The manufacturer guarantees 99 percent removal of all entrainment.—*V. D. Anderson Co., 1935 W. 96th St., Cleveland 2, Ohio.*



Metal Strapping
Fastens Insulation Securely

All types of insulation materials can be applied quickly, economically and permanently to pipes, ducts, tanks and flat walls with a new metal strapping called Finger Strap. The new strapping is ¾ in. wide in thicknesses from 0.015 to 0.035 in. Tapered fingers, ¼ in. wide and spaced at intervals of 5 to 12 in., serve to secure the insulation.

Finger Strap is applied around tanks, ducts or pipes with a strapping tool; it can also be nailed or screwed to walls or other flat surfaces. Once fastened, the steel fingers are lifted outward to a 90-deg. angle and the insulation impaled on them. A slit washer is then slipped on the finger tip protruding through the insulation, and the tip is bent firmly back against the washer.

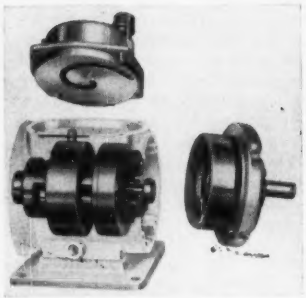
The new strap is available in continuous coils in plain steel, galvanized, stainless Type 430 or Monel. Fingers are from 1⅜ in. to 4½ in. long as specified.—*A. J. Gerrard & Co., 1950 Hawthorne Ave., Melrose Park, Ill.*

Oil Filter
Has Permanent Element

A new engine oil filter features a permanent porous metallic filter element. According to the manufacturer, this filter passes oil six times faster than the conventional type, removing foreign matter as minute as 5 microns. Oil will not bypass the unit even when cold and thick.

The filtering element is constructed of carefully sized spherical-shaped bronze particles which are fused together at their points of contact. Cleaning of the element is accomplished by rinsing with gasoline.

Conversion kits are available for converting conventional filters. Prices start at $6.95.—*Permanent Filter Corp., 309 Riverside Dr., Los Angeles 39, Calif.*

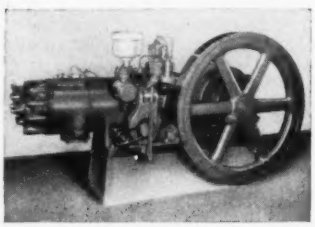


New Transmission
Gives Variable Speed

This variable-speed transmission is a new lighter powered unit recently added to the line of Graham transmissions. It is designed for operation at 1,800 rpm. input without the use of auxiliary spring loading.

A wide speed range can be covered from zero to any desired maximum with good accuracy in holding constant speed. The unit can be reset exactly to any desired speed. It is said the transmission provides foolproof overload protection without any danger of damage in the event of stalling.

The Graham drive uses a familiar compound planetary gear system, except that the non-rotating member is a traction ring engaging two or more tapered rollers at varying diameters. The ring is moved lengthwise of the transmission to change the speed. The rollers are supported in a carrier and are inclined at an angle equal to their tapers. This maintains the outer edge of the rollers parallel to the central axis. Required traction pressure is obtained by centrifugal force pushing the rollers outward against the ring.—*Graham Transmissions Inc., 3754 North Holton St., Milwaukee 12, Wis.*



Diesel Engine
Can Burn Natural Gas

The new Lorain Model DA diesel engine can be operated as a cold-starting full diesel, or can be converted in the field to burn natural gas

or butane. Designed as a companion power plant to the Model L, O and R engines, the new unit has a 13-in. bore and stroke and continuous rating of 55 bhp. at 325 rpm.—*White-Roth Machine Corp., Lorain, Ohio.*

Perspective Graph Paper Converts Drawings

A new type of perspective graph paper has been devised to permit scaling directly from an engineering drawing into an accurate perspective view. Based on the principles of visual perception, these new graphs are entirely free from the distortion that is evident in most mechanical perspective methods. By their use, perspective projection becomes as simple and rapid as isometric projection. As an important added advantage the subject depicted is drawn as the eye actually sees it.

The graphs are designed to represent an inversion of the six faces of a cube. Each of the six planes is a grid, graduated in true perspective foreshortening, from which dimensions may be plotted and projected.

A complete set includes seven basic graphs, each one designed to view the perspective grids at a different angle. Each graph may be used as a top view or, by inverting, it as a bottom view. This gives you a choice of 14 different views. On each of the graphs distortion-free perspective drawings can be made in sizes from 8 × 10 in. up to the full graph dimension of 30 × 60 in.—*Tech-Art Graphs, 315 S. 15th St., Philadelphia 2, Pa.*

Roller Chain Has Built-in Lubrication

A new sintered-bushing chain promises a marked increase in service life where adequate lubrication is not otherwise available. Lubrication for the rollers is provided by impregnating the sintered metal bushings with oil. This innovation should extend the use of roller chain in mechanical power transmission.

Indicated uses are in the textile industry, where external lubrication is taboo due to the possibility of oil spotting the fabric. In gritty or abrasive environments where totally enclosed drives are required, such a unit could replace standard roller chains which wear abnormally from lack of lubrication.

Recent tests of the sintered-bushing chain alongside a standard prelubricated roller chain indicated an increase of several hundred percent in anticipated service life.—*Whitney Chain Co., Hartford, Conn.*

—End

KELVINATOR has standardized on

PLATECOIL

REPLACES PIPECOIL

The Flexseal Melting Tank pictured above is one of many heating processes utilizing Platecoils at the Kelvinator Division, Nash-Kelvinator Corp., Detroit, Michigan. They have found that Platecoils have so many advantages for heat transfer operations that they have standardized on their use in such applications as alodizing tanks, defluxing dip tanks, defluxing washers, parts washers and dip alodizing systems.

★ **MORE EFFECTIVE HEATING.** Platecoil's faster heating has resulted in quicker starts for those applications shut down during the night.

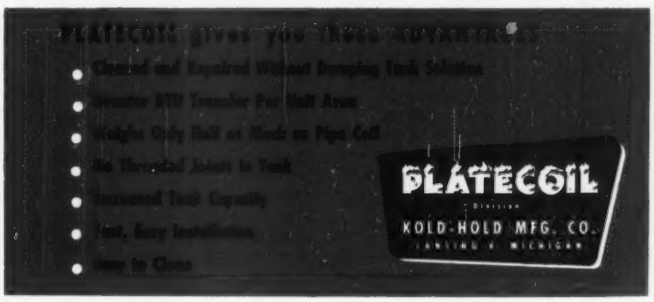
★ **MORE WORKING CAPACITY.** Platecoils take up less room in the tank than the pipe coils formerly used.

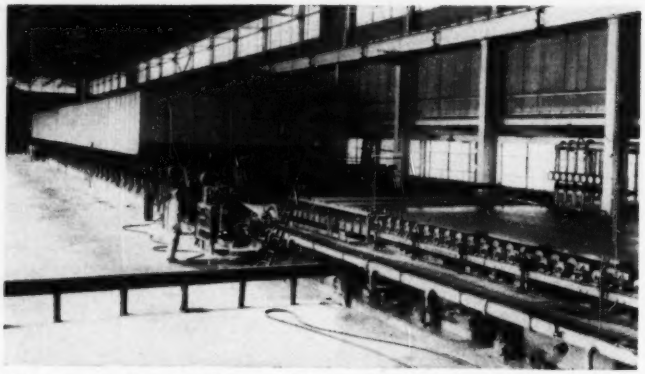
★ **STEAM LEAKS REDUCED.** Platecoils have no joints in the solution. Irritating steam leaks have been greatly reduced.

★ **SAVES DOWNTIME AND DUMPING OF SOLUTION.** Platecoils are easily removed for maintenance without dumping tank solution as was previously required. All connections are outside the solution. Platecoils are disconnected, lifted out and replaced in a hurry.

★ **EASY CLEANING SAVES DESCALING TIME.** There is no comparison in the time it takes to descale the Platecoils used in Phosphatizing solutions and the pipe coils formerly used. The Stainless Steel Platecoils pick up less scale in the first place — and this is quickly removed by brushing. Compare this to the hours of pickling and chipping formerly required.

You, too, can save money by using Platecoils in most any application where pipe coils are now used. Why pay more, when Platecoils will give you more efficient heating at less cost? *Send today for your copy of bulletin No. P61.*





This conventional paper making machine can make new quartz and ceramic papers.

Insulating Papers Vs. Asbestos

Resistance to temperature and radioactivity, low-cost domestic supplies of raw materials, make two new papers attractive competitors for asbestos.

Quartz paper and ceramic paper, both with superior properties for electrical insulation, can now be cheaply made from abundant domestic materials.

Quartz paper withstands temperatures to 3,000 deg. F.; ceramic paper withstands 2,500 deg. Compare these with an upper limit of perhaps 1,000 deg. for asbestos.

Navy scientists, who developed the papers, see potential uses for them as insulation in nuclear energy power plants, including nuclear-power Naval vessels. Neither contains boron or similar chemical elements which trap neutrons. These elements become radioactive if used to insulate cables or other equipment in the neighborhood of nuclear reactors of piles.

Manufacture of paper from both quartz and ceramic fibers closely resembles conventional paper-making. Their extreme fineness makes this possible. Individual fibers are much less than a micron in diameter.

The Navy makes the quartz paper from high-silicon or quartz fibers made by standard techniques. All ingredients except silica are leached out with acid. Neutralizing and drying comes after that.

They add the pulp to water in a paper beater and circulate the stock for a short time. It is then dumped into a chest. From there they pump it to a conventional Fourdrinier paper-making machine.

In a recent test run at the National Bureau of Standards, the machine was able to run at 40 ft. per min. to turn out paper 0.005 in. thick.

Actually, two types of quartz fibers have been made into paper—hydrous and anhydrous. Thus the hydrous fiber duplicates the asbestos in this respect.

Paper made from anhydrous fiber seems destined for wide use as an electrical insulating material where resistance to high temperature and low electrical losses at high frequencies are required. The type of asbestos commonly used for electrical insulation is made from foreign fiber. Domestic fiber, or so-called Canadian asbestos, is not readily suitable for such use because it contains magnetite, a form of iron ore. NRL quartz paper is magnetite-free.

Both hydrous and anhydrous fibers are inherently very porous because of their bulk. This property suggests application of the paper for gas mask and other types of filters. Paper made from the hydrous fibers has a low dielectric constant and appears to be an excellent material for use in radomes, or radar antenna housings. In addition, the ion-exchange properties of this paper should make it useful in water purification systems, in making drinking water from sea water, for example.

The Navy uses a fractionating box or riffler to remove the black impurities which comprise about 60 percent of the basic material. About 30 percent of what remains is in a fluffy white fibrous form and 10 percent is in a granular form. The former goes into the paper, the latter appears to be very suitable for use in thermal insulation.

For paper-making purposes, bentonite clay, a material similar to fuller's earth, is added to the fiber. When the fiber is bonded with suitable resins, it can be laminated into fireproof panels, easily machined or drilled. Such panels would be useful for switchboard panels and similar installations where resistance to fire plus electrical insulation is needed.

Basic material from which the ceramic paper and laminate was produced in the laboratory came from the Carborundum Co., Niagara Falls.—*Naval Research Laboratory, Washington 25, D. C.*

Ethylene Carbonate

Offers a new route to preparation of agricultural chemicals, resins, fungicides.

Ethylene carbonate, now available in pilot plant quantities, has interesting properties as a high-boiling solvent. It is a good solvent for acrylonitrile polymers. Such solutions may be used in the extrusion of polyacrylonitrile fibers and tubes.

It is also a solvent for lignin, nitrocellulose, nylon, vinylidene chloride-acrylonitrile copolymer, cellulose acetate and certain other polymeric materials. And it has potentialities as a selective or extractive solvent.

Ethylene carbonate is an odorless, colorless, low-melting solid. It is not hygroscopic and is not corrosive. Its melting point is 35-36 deg. C, boiling point at 740 mm is 243-244 deg. C.

For hydroxyethylation, ethylene carbonate is valuable where equipment for handling gaseous ethylene oxide is not available. It reacts with a variety of compounds containing an active hydrogen to give beta-hydroxyethyl derivatives such as would be obtained by using ethylene oxide. Further reaction with the beta-hydroxyethyl derivatives to give polyglycol ethers as

side products ordinarily occurs—as is likewise the case with ethylene oxide.

The hydroxyethylation reaction is run at 100-200 deg. C. employing a basic catalyst such as potassium carbonate. It proceeds with alcohols, mercaptans, phenols, thiophenols, amines and carboxylic acids. Ethylene carbonate is the only reagent known thus far that will hydroxyethylate apocupreine and, presumably, similar phenolic alkaloids.

It reacts with aliphatic amines to form carbamates. Thus it suggests a new way to prepare agricultural chemicals, resins, fungicides, pharmaceuticals, plasticizers.

Decomposition of ethylene carbonate to yield ethylene oxide and carbon oxide may prove useful in fumigant applications.

The properties of ethylene carbonate suggests its use as a selective solvent. In particular, certain compounds containing both hydrogen and chlorine on the same carbon atom may be extracted readily from their solutions. For example, chloroform is easily extracted from carbon tetrachloride by ethylene carbonate.

Mild steel, stainless, copper and brass are not corroded or damaged after exposure to ethylene carbonate for several months at 170-190 deg. C. Satisfactory gasket materials include neoprene, ordinary rubber, cork, and polythene.

Although the physiological properties of ethylene carbonate have not been investigated fully, preliminary reports indicate that it will be found essentially nonirritating and nontoxic.—*Jefferson Chemical Co., 260 Madison Ave., New York 16, N. Y.*

Acrylic Monomer

To make adhesives, dispersing and thickening agents, surface coatings.

Acrylamide is a crystalline product with comparatively long shelf life and easily-gained polymerization and copolymerization.

Potential applications for the polymers and copolymers of Acrylamide include the preparation of adhesives, dispersing agents, thickening agents, surface coatings, synthetic leathers and rubbers, and finishing agents for paper and textiles. Modification of acrylonitrile fibers by the incorporation of Acrylamide is said to produce an approved affinity for acid dyes in general.

A reactive double bond permits the addition of a variety of compounds

IN BRIEF—A capsulated listing of this month's newsworthy products

It's New . . .	It's Good For . . .	See Page . . .
Ceramic Paper	Electrical insulating material	248
Ethylene Carbonate	Agricultural chemicals, resins, fungicides	248
Acrylic Monomer	Adhesives, dispersing and thickening agents	249
Detergent	Producing copious grease-resistant foam	249
Miticide	Killing mite eggs on citrus fruit trees	249
Paint Resin	Superior deflocculating action	249
Fiberglas Tanks	Longer lasting water and fuel tank trucks	250
Fining Agent	Eliminating copper from wine	250
Insulating Powder	Minimizing ferrous pick-up in aluminum making	250
Catalyst	Promoting drying of epoxy resin finishes	252
Polyvinyl Alcohol	Manufacture of tough, water soluble resins	252
Ceramic Coatings	Parts of heat exchangers, bellows, furnace parts	254
Protective Coating	Exteriors and interiors of mixers, tanks	254

such as alcohols, amines, mercaptans and dienes. It is reactive to formaldehyde, forming methylolacrylamide or methylenebisacrylamide. This general reactivity makes Acrylamide of value as a chemical intermediate as well as a monomer.—*American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.*

Detergent

Low-priced, high foaming liquid.

New detergent is said to produce copious foam which is unusually resistant to the destructive action of grease and other soils encountered in dishwashing, carwashing, rug shampoos. Called Ninex 21, it contains a specially developed amide-type foam stabilizer.

Ninex 21 thickens up when water is added. It is thus possible to dilute the product extensively for repackaging yet still maintain high viscosity.

Other important features of this new product are non-rusting properties, absence of odor and resistance to freezing.

Ninex 21 contains 60 percent of active detergent. It can also be supplied as a 100 percent active liquid to reduce transportation costs.—*Ninol Laboratories, 1719 South Clinton St., Chicago 16, Ill.*

Miticide

Most destructive in the egg stage; will kill for several weeks after application.

A new extremely fine wettable powder is outstandingly destructive to mites in the egg stage. In fact, it is more effective as an ovicide than as an adulticide. It also has a long residual effect.

Called Ovotron Wettable, it contains 50 percent *p*-chlorophenyl-*p*-chlorobenzenesulfonate.

Its toxicity to warm-blooded animals as well as to parasites and predators of crop pests is low. It is also reported to have low toxicity to insect pollenizers which are important to crop production.

Growers now have the oppo tunity to combine chemical and biological control in one operation. At the same time Ovotran Wettable is not hazardous to the operator.

It is chemically compatible with other insecticides and fungicides. For example, it is compatible with such chlorinated hydrocarbons as DDT, toxaphene, chlordane, methoxychlor and lindane, with phosphates, arsenicals and lime-sulphur. Ovotran Wettable is one of a very few materials that is compatible with alkaline mixtures.

To date, it has shown unusual miticidal effectiveness on citrus and deciduous fruit and nut trees, shade trees, ornamental shrubbery, cotton, melons, grapes and other crops. Widespread field tests have shown that this chemical is not injurious to these same plants and trees when it is used as suggested. With a few exceptions, it appears relatively nontoxic to plant foliage.—*Dow Chemical Co., Midland, Mich.*

Paint Resin

Improved in color and as a deflocculating or pigment-dispersion agent.

New paint resin is superior to its manufacturer's older milled resin in three respects:

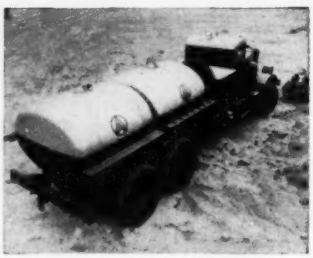
Solutions of the new resin are improved in color, being water-white; the material is an improved deflocculating or pigment-dispersion agent; and, it has definitely faster solvation properties.

The new resin joins Goodyear Tire & Rubber Co.'s Pliolite family as S-5B, and may be substituted for the older milled resin, Pliolite S-5, on a pound for pound basis at about 5 cents per pound under the cost of milled material. The new material is treated dur-

ing the production cycle to eliminate the milling operation.

Like Pliolite S-5, it is a copolymer of styrene and butadiene. The company expects the new material to eventually replace its predecessor because of its improved quality and reduced cost.

Formulations and manufacturing techniques based originally on the milled resin can be used to produce high quality concrete floor paints, wall sealers, tinted and deep tone exterior stucco and concrete finishes, aluminum paints and metal primers.—*Goodyear Tire & Rubber Co., Akron, Ohio.*



Resin-Fiberglas Tanks

Now they're using polyester resin reinforced with Fiberglas mat to make fuel- and water-carrying tanks.

Arabian American Oil Co. has equipped 15 trucks with the new tanks—two 1,000 gal. fuel-carrying tanks and one 100 gal. water tank on each. These are expected to last from 10 to 50 times as long as steel ones.

Replacement costs of steel tanks have always been a major problem on the dessert. A sandstorm rips off the paint, night dampness starts corrosion, the next sandstorm takes off the rust, and the process starts all over again. The plastic tanks cannot rust and problems posed by severe weather are kept at a minimum.

American Cyanamid supplies Laminac polyester resin for the tanks. Fiberglas reinforcement comes from Owens-Corning.

Another advantage over steel is that inside, the plastic tanks cannot corrode from the salt in crude and refined petroleum. Because of their lighter weight, and because reinforced Laminac is stronger than steel, plastic tanks can be made larger than steel ones, adding substantially to the payload.

Aramco's new fuel carrying tanks, weighing 1,000 lb. mounted, have over ⅓ more capacity than steel tanks of the same weight. Both the water and fuel-carrying tanks have smooth inside surfaces that can be steamed clean.

Repair kits are available in Arabia for the quick repair of any ruptures in the tanks. The repair requires only a simple cleaning of the ruptured area, then closing and reinforcing the rupture with the plastic-impregnated Fiberglas mat included in the repair kit. When a steel tank is broken, the break must be welded and in the case of inflammables, the tank must be drained and thoroughly steamed clean before welding.

Other applications of the Laminac-Fiberglas combination in the new trucks include the housing for the pumping mechanism and walkways along the truck's sides.

The tanks are molded by a special process by Carl N. Beetle Plastics Corp., Fall River, Mass.—*American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.*

Fining Agent

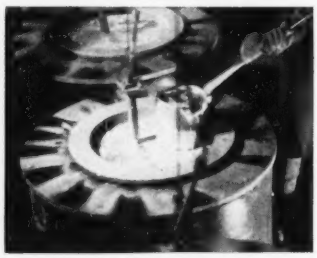
Advantages over competitors: eliminates copper from wine; does not alter composition or taste; immediately filterable.

A new and improved fining agent designed to eliminate trace amounts of copper and iron has just received a year's probationary approval from California's Dept. of Public for industry-wide winery use. If all goes well additional applications of the compound will aid production of other fermented beverages such as whiskey and beer, of certain pickled foods (traces of copper, for example, turn olives and dill pickles an unnatural green), and of lactic and other acids where metal contamination is a problem.

Wine chemist J. H. Fessler, after whom the compound is named has been working on the problem of metal contamination in his Berkeley Yeast Laboratory since 1936. The principal cause of non-microbial wine spoilage was first thought to be iron alone, later was shown to involve copper as well. Wines can tolerate (contain but never cloud) only about 1/50th as much copper as iron. In addition, while iron causes clouding in winery storage tanks before shipment, copper never causes clouding until after the wine has matured. Wine, perfectly brilliant at the time of bottling, often turns cloudy on retailers' shelves or in the consumer's home. So to be considered stable to metal clouding wine should be entirely free of copper. Fessler Compound, in varying quantities, can selectively extract copper, or both copper and iron, either completely or to a reduced concentration.

Fessler Compound, brown, creamy complex of potassium ferrocyanide, cuprous hydroxide and citric acid, has several advantages over all present fining agents. Principally, it easily reduces copper concentrations to 0.00 ppm., does not alter the composition or taste of wine in any way, can be filtered immediately, and entails no danger of over-fining. No difficulties resulted when as much as 10 times the recommended quantity of Fessler Compound was used. The only precaution necessary is to wash the treating tank with 1 percent soda ash solution before reusing.

Relatively low price is another advantage. Based on the average requirement of 2 gal of compound per 1,000 gal. of wine, treatment costs per gal range from 0.5-0.7 cents, depending on the quantity treated and the size of the package purchased.—*Cuvinex Co., San Francisco.*



Insulating Powder

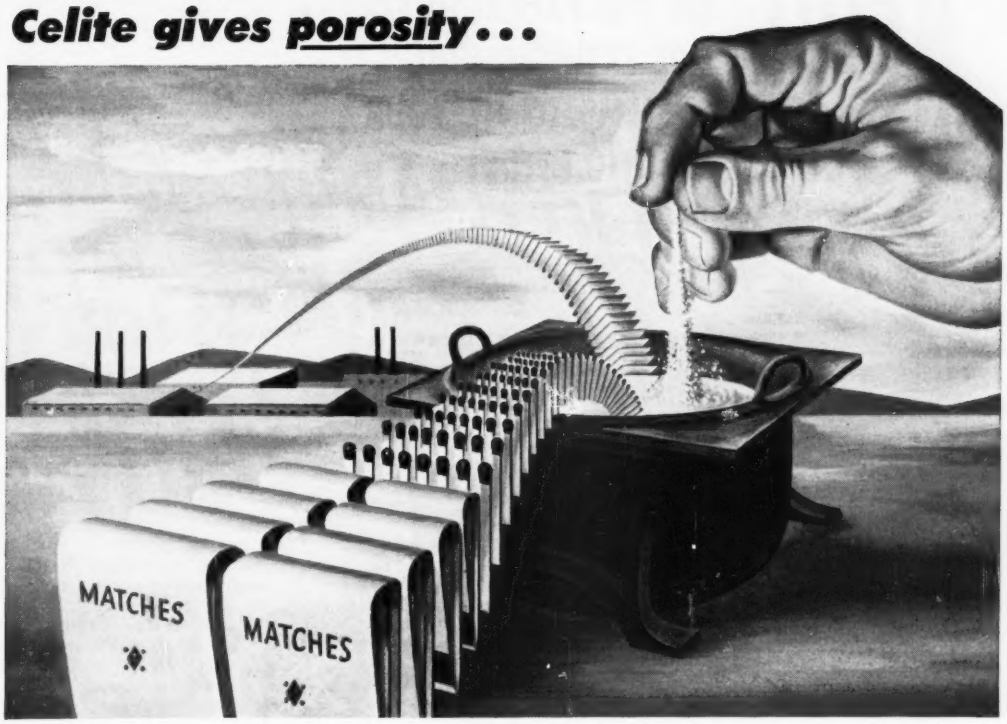
Coating melting pot, thermocouple protective tubes, pouring ladle, it stops molten aluminum from picking up iron from them.

Current shakiness of the aluminum supply is adding importance to an insulating powder for preventing contamination of the metal during melting, alloying and casting operations.

Insulating powder R-20 is used to form a slurry coating which minimizes ferrous pick-up and at the same time protects valuable foundry equipment. The extremely fine yellowish-brown powder is obtained, by washing and straining, from the insoluble residue resulting from the digestion of bauxite in the Bayer process of making alumina.

Mixed with water and sodium silicate, it is applied in slurry form to the parts to be protected. Spraying,

Celite gives porosity...



Adding "Safety Valves" to match heads

Incorporated in match heads, Celite Mineral Fillers act as "safety valves" to prevent flare-up and kill afterglow.

The explanation: *Celite's porous, thin-walled, cellular structure gives the match heads greater porosity so that gas can escape quickly.*

Celite's abrasive quality also makes matches easier to strike. And from a production line standpoint, the high absorptive capacity of this mineral filler speeds drying of the match heads . . . while its light weight and great bulk improve dispersion of the active chemicals in the match head mix.

These and other unusual physical characteristics adapt Celite Mineral Fillers to numerous industrial uses.

THESE CELITE PROPERTIES BENEFIT MANY TYPES OF PRODUCTS

Celite's minute, chemically inert particles have an irregular, spiny structure—which accounts for their efficiency as a delicate abrasive in polishes, as a flatting agent in paints, varnishes and lacquers, and as a reinforcing agent for paint films and rubber products.

Celite powders can absorb up to three times their own weight of liquid—making them particularly useful in preventing ammonium nitrate crystals from caking, in absorbing liquid insecticide poisons, and in controlling pitch trouble at paper mills. And because the loose weight of Celite averages only 10 pounds per cubic foot—these mineral fillers are employed to fluff-up insecticide dusts and household cleansers, as well as to extend white pigments in paper manufacture.

If you are looking for the "extra something" to lift your product above competition—at no extra cost—why not discuss your problem with a Johns-Manville Celite Engineer? For further information and samples, write Johns-Manville, Box 60, New York 16, N. Y. In Canada: 199 Bay Street, Toronto 1, Ontario.

CHECK LIST OF PRODUCT BENEFITS OBTAINABLE AT LITTLE COST WITH CELITE MINERAL FILLERS

- Added Bulk
- Better Suspension
- Faster Cleaning Action
- Greater Absorption
- Improved Color
- Better Dielectric Properties
- More Durable Finish
- Increased Viscosity
- Elimination of Caking
- Higher Melting Point
- Better Dry Mixing
- Improved Dispersion
- Greater Porosity

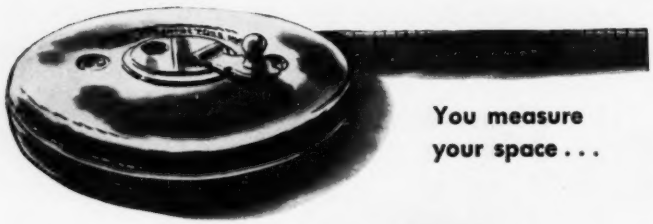
JOHNS-MANVILLE JM PRODUCTS

Johns-Manville CELITE®

MINERAL FILLERS

NEW! NOW!

SIX PRE-PACKAGED CO_2 FIRE EXTINGUISHING SYSTEMS TO FIT YOUR SPECIFIC NEEDS!



You measure your space . . .

anybody who can cut pipe can install them

Here's inexpensive built-in carbon dioxide fire protection against normal flammable liquid and similar hazards.

The new Kidde Standard Pak is a ready-made, pre-engineered fire extinguishing "package" for volumes up to 6,000 cubic feet. Anyone who can cut pipe can install it. Each kit contains dependable Kidde rate-of-rise heat detectors, efficient Kidde Multijet nozzles, and automatic discharge heads. Paks are supplied with or without pipe and fittings. Optional accessories include pressure trips and switches, remote controls, sirens, gongs.

A choice of six sizes assures you of the right package for your particular requirements. For full information send us coupon below.

Kidde

Walter Kidde & Company, Inc.
728 Main Street, Belleville 9, N. J.
Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

Please send me details on the
New Kidde Packaged Fire Extinguishing System

NAME_____

FIRM NAME_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

dipping or brushing will do the job. If the metal parts are heated to between 200 and 400 deg. F., the coating dries faster and sticks tighter.

The R-20 coatings are applied to molds, ladles, melting pots, pouring troughs, tools used for mixing alloying and cleaning, and to any other ferrous metal equipment which comes into contact with molten aluminum. —*Aluminum Ore Co., 801 Gulf Bldg., Pittsburgh 19, Pa.*

Catalyst

Promotes drying of baked finishes based on pure epoxy resins or combinations of them.

A new catalyst, Soligen Rare Earth Naphthenate 4%, aids greatly in increasing the molecular cross linking of heat reactive resins. These resins subsequently make harder and tougher films.

Immediate applications for this product are as drier catalysts in baked finishes which are based on pure epoxy resins or combinations of epoxy resins, urea-formaldehyde, melamine, or alkyd resins. Use of the new product is most interesting in white baking enamels because of its color retention as compared to cobalt drier even when baked for 30 min. at 350 deg. F. or 15 min. at 380 deg. F.

It can be used with baking type soft oil alkyds such as soya or dehydrated castor oil alkyds. As little as half the amount of Rare Earth metal can replace the normal amount of cobalt metal. It is said to produce equal drying performance with improved toughness of film, and with the absence of the usual discoloration at elevated temperatures. — *Advance Solvents & Chemical Corp., 28th St and Fifth Ave., New York 16, N. Y.*

Polyvinyl Alcohol

For the manufacture of waterproof adhesives, thickening agents, laminating adhesives.

Six standardized grades of polyvinyl alcohol are manufactured under the trade name Lemol. They are said to provide tough, water soluble resins combining high tensile strength, adhesiveness and tear-resistance with extreme inertness to ageing, oxidation and bacterial action.

Of high viscosity and completely hydrolyzed, they are meant for compounding with polyvinyl acetate emulsions for waterproof adhesives, thickening agents, laminating adhesives, saturants for high strength paper, wet

HEYDEN FORMALDEHYDE

for new uses...

for expanded uses...

Here is a product that has grown extensively and is still growing to serve your needs. Heyden pioneered the commercial production of formaldehyde and has expanded its facilities steadily to keep pace with the increasing demand for this essential raw material for the chemical and allied industries.

This continued growth is based on solid foundations such as meticulous attention to special customer requirements. Supplying the highest quality product has always been a first consideration. Every effort has been made to match the purity and uniformity of the product with cooperative and helpful service from our sales and technical staffs. Extensive research on the packaging, shipping and handling of formaldehyde has rounded out the service that has helped to keep Heyden customers satisfied.

Count on Heyden for your formaldehyde supply. It is available as Formaldehyde Solution N.F. and shipped in tank cars, tank trucks, drums, carboys and bottles. A 37% methanol-free grade is also available.

PARAFORMALDEHYDE

A solid form of formaldehyde. U.S.P. X Powder, Flo Granules and Granules.

HEXAMETHYLENETETRAMINE

A dependable source of anhydrous formaldehyde for resins, plastics, chemicals. Technical and U.S.P., granular and powder.

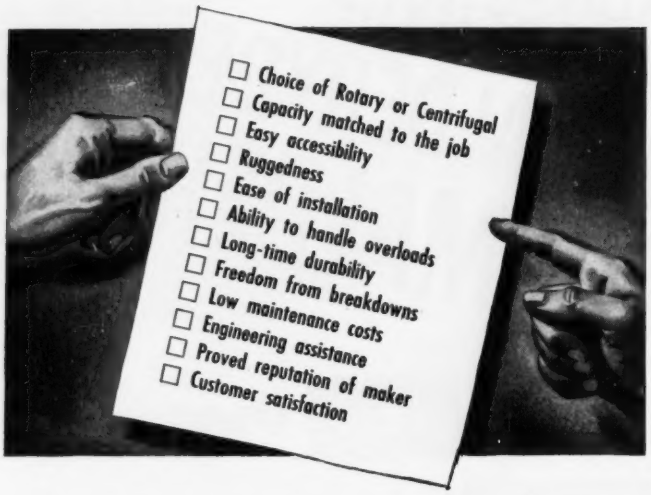
Serving Industry through Finer Chemicals

Benzaldehyde • Benzoates
Benzyl Chloride • Bromides
Chlorinated Aromatics
Creosotes • Formaldehyde
Formic Acid • Glycerophosphates
Guaiacols • Hexamethylenetetramine
Medicinal Colloids
Methylene Disalicylic Acid
Neomycin • Paraformaldehyde
Parahydroxybenzoates • Penicillin
Pentaerythritols • Propyl Gallate
Resorcinol • Salicylates
Salicylic Acid • Streptomycin

FINE HEYDEN CHEMICALS

HEYDEN CHEMICAL CORPORATION
342 Madison Ave., New York 17, New York
CHICAGO • PHILADELPHIA • SAN FRANCISCO • DETROIT • PROVIDENCE

BEFORE BUYING *any* BLOWER COMPARE THESE ESSENTIALS


☐ Choice of Rotary or Centrifugal
☐ Capacity matched to the job
☐ Easy accessibility
☐ Ruggedness
☐ Ease of installation
☐ Ability to handle overloads
☐ Long-time durability
☐ Freedom from breakdowns
☐ Low maintenance costs
☐ Engineering assistance
☐ Proved reputation of maker
☐ Customer satisfaction

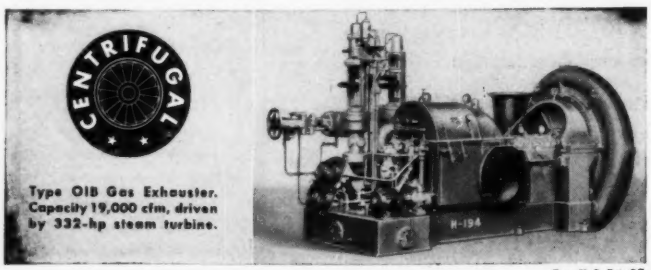
When production depends so vitally on adequate handling of gas or air, you can't afford to take chances on the performance of your blowers or exhausters. It's better to be safe than sorry.

So, for new installations or replacements, we suggest that you evaluate the equipment by the above standards of comparison. This will help determine the unit that will be most effective, economical and reliable for your specific applications.

Be sure to include the R-C *dual-ability* line of both Centrifugal and Rotary Positive types. Remember, that only we offer you this *dual choice* —with unbiased recommendations from almost a century of experience. With capacities from 10 cfm to 100,000 cfm or higher at moderate pressures, R-C equipment has a long record of outstanding performance in industrial applications.

We'll gladly send detailed information for comparison—or supply engineering help if we can be of service.

ROOTS-CONNERSVILLE BLOWER CORPORATION
521 Illinois Avenue, Connersville, Indiana



Reg. U. S. Pat. Off.

ROOTS-CONNERSVILLE
BLOWER BUILDERS SINCE 1854
ONE OF THE DRESSER INDUSTRIES

strength paper, grease resistant paper coatings.

Medium viscosity, completely hydrolyzed Lemols are particularly recommended for unsupported film, grease proof barrier and solvent resistant gasket stock. They may be used in temporary protective coatings, as binder for pigmented paper coatings, as surface sizing of paper and pigmented binder in paper coatings.

Then there are low viscosity completely hydrolyzed Lemols permitting higher working concentrations.—*American Monomer Corp., Leominster, Mass.*

Ceramic Coatings

Used on parts of heat exchangers, bellows and other chemicals processing equipment, they're saving strategic metals.

The Solaramic process is a method of ceramic coating metals to extend their life in high temperature use.

The coatings conserve scarce materials in two ways: they reduce or prevent oxidation and corrosion at temperatures ranging from 1,500 to 2,000 deg. F.; they allow the more easily obtainable steels, such as stainless, to be substituted for hard-to-get higher alloys without cutting the useable life of the item.

Among the industrial applications of Solaramic coated parts that have already been tested are: petroleum refining equipment, unit heater components, oil burner parts, industrial bellows for chemical process industries, industrial gas turbine parts, thermocouple components, chemical processing equipment, heat exchangers.

Among the firms using them: Hooker Electrochemical Co., Du Pont, Dow Chemical Co., Standard Oil Development Co., Petro-Chem Development Co.

Developer of the process, Solar Aircraft Co., is continuing research on improved coatings and new applications for coatings. Solar recently licensed Ferro Corp., Cleveland, to manufacture and sell the products.—*Solar Aircraft Co., 2200 Pacific Highway, San Diego 12, Calif.*

Exteriors and interiors of mixing blending and storage tanks containing acid, alkali and salt solutions can now be protected against corrosion with Lankote 200 Series coatings. Nontoxic plastic coatings, they are also said to resist water, some solvents and abrasion. They can be applied by brush or spray. —Lankote Division, J. Landau Co., 221 Wooster St., New York 12.

LOWER YOUR COST—
INCREASE YOUR PRODUCTION IN
CRUSHING AND GRINDING OPERATIONS!

WILLIAMS *Heavy Duty*

HAMMER MILLS

With a Williams, you don't need a primary crusher and another two or more secondary grinders—because *a single Williams Hammer Mill does the complete job in one operation!*

That means no additional machines are necessary—no extra foundations, housing, conveyors, drives or other equipment—*a saving up to 75% on initial investment!* And because a Williams does the job faster and better, you can *cut your crushing costs up to 50%!*

There's a Williams to suit *your* specific need, no matter what it is! It will pay you to *get the facts now!*

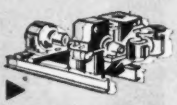
OTHER WILLIAMS EQUIPMENT

ROLLER MILLS
—IMPACT and DRYER MILLS
—for fine grinding to 400 mesh or micron sizes

AIR SEPARATORS
—any type; for precision control and high production in fine grinding

VIBRATING SCREENS
—in any size for any job. 1 to 3 decks, open or enclosed.

HELIX-SEAL MILLS
—for dust-free grinding, and for wet, sticky, greasy materials.



Also COMPLETE "Packaged" PLANTS for crushing, grinding, separating.

AT YOUR SERVICE WITHOUT COST—
WILLIAMS TESTING LABORATORY

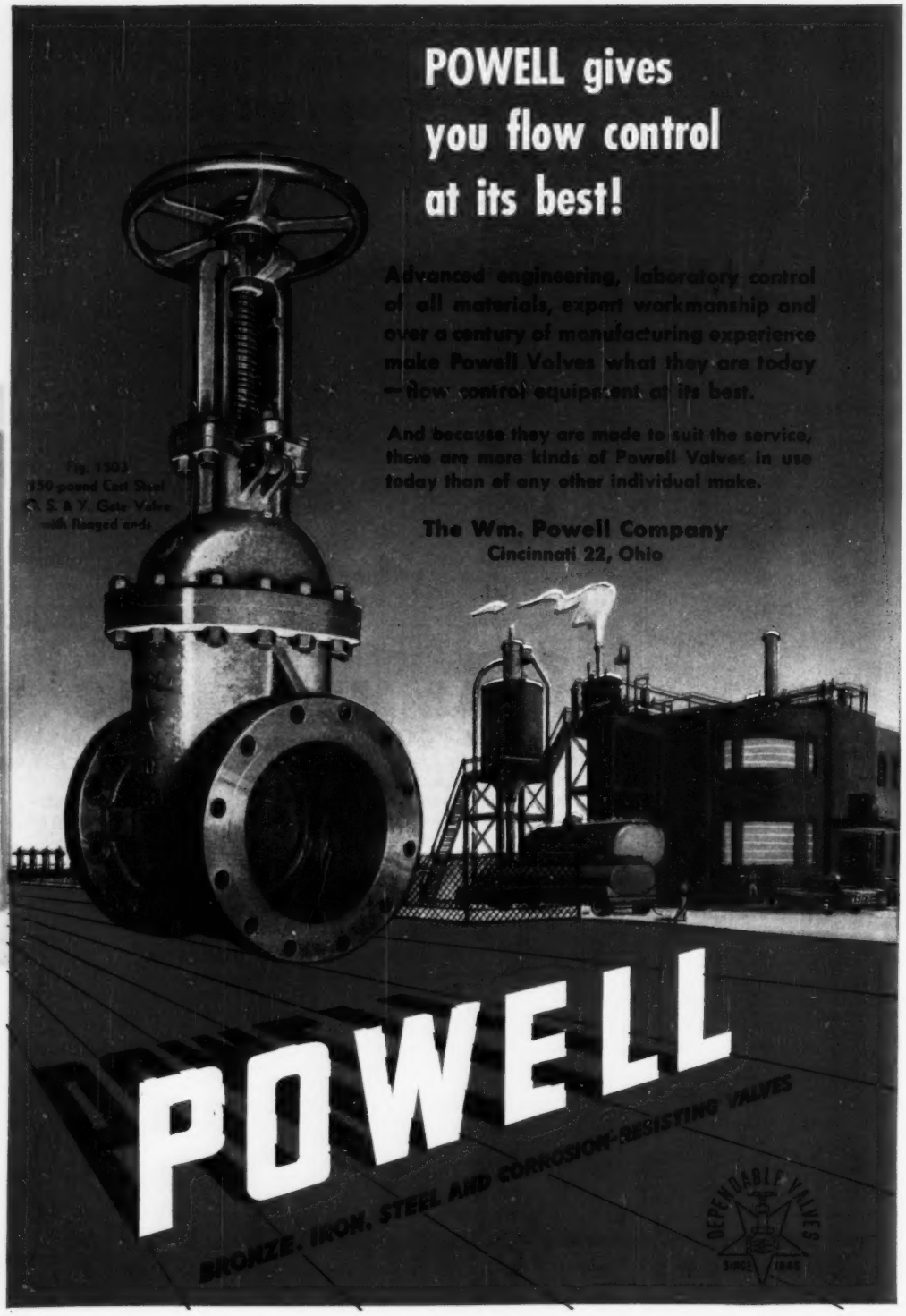
Whatever your material or product, Williams will help you solve your grinding, crushing or shredding problems without charge or obligation. Just bring or send a sample of your raw material and describe the results you want. Williams Equipment is now being used for the reduction, sizing and separation of virtually every type of chemical, mineral, vegetable or animal matter with greater speed and economy.

WILLIAMS PATENT CRUSHER AND PULVERIZER CO.
2706 North Ninth St. St. Louis 6, Mo.

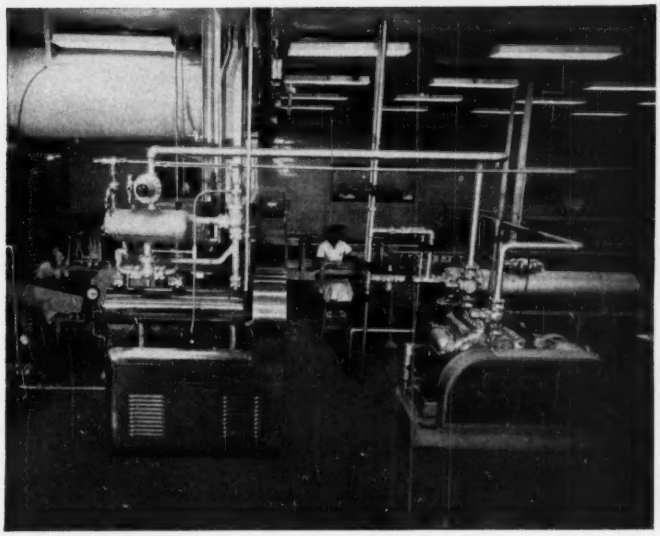
WILLIAMS

CRUSHERS GRINDERS SHREDDERS

OLDEST AND LARGEST MANUFACTURER OF HAMMER MILLS IN THE WORLD


POWELL gives
you flow control
at its best!
Advanced engineering, laboratory control of all materials, expert workmanship and over a century of manufacturing experience make Powell Valves what they are today — flow control equipment at its best.
And because they are made to suit the service, there are more kinds of Powell Valves in use today than of any other individual make.
The Wm. Powell Company
Cincinnati 22, Ohio
Fig. 1503
150 pound Cast Steel
O. S. & Y. Gate Valve
with flanged ends
POWELL
BRONZE, IRON, STEEL AND CORROSION-RESISTING VALVES
DEPENDABLE VALVES
SINCE 1846

Girdler Process News



Fast continuous process for petroleum jelly uses

VOTATOR®
HEAT-TRANSFER APPARATUS

HERE'S another application where VOTATOR Heat-transfer Apparatus saves production time. At Plough, Inc., Memphis, this equipment has permitted very high efficiency in proces ng and packaging Moroline brand Petroleum Jelly. The processor reports: "The equipment has been operating with high efficiency for five years now and we have never had equipment that required less attention or maintenance."

Substantial labor savings are achieved with VOTATOR Heat-transfer Apparatus, since less handling is required and the processing is completed in a matter of seconds. Close control over the entire operation assures uniformity of product, and prevents contamination. The whole process is faster, cleaner, and more economical—and takes less floor space than other methods.

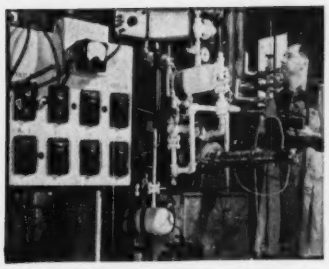
VOTATOR Heat-transfer Apparatus is widely used for heating or cooling, crystallizing, controlling heat of reaction, and many other processes. Girdler's complete service includes process engineering and design, manufacture of equipment, and installation. Call on Girdler in the *planning stages* of your processing facilities.

the **GIRDLER** *Corporation*

LOUISVILLE 1, KENTUCKY

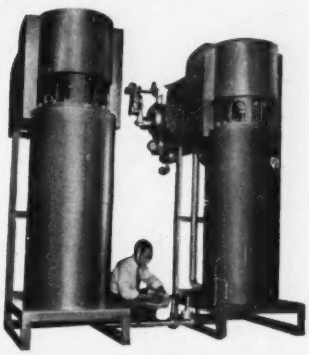
Gas Processes Division **Votator Division** **Thermex Division**

PROCESS ENGINEERS • DESIGNERS AND CONSTRUCTORS



Process Research

Girdler's pilot plant and laboratory facilities are available for the development of new processes and equipment, and for special research on new processing applications. Outstanding Girdler chemists and engineers have developed distinctive processes and equipment for many operations. Let Girdler help with your process problems.

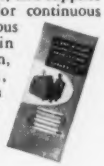


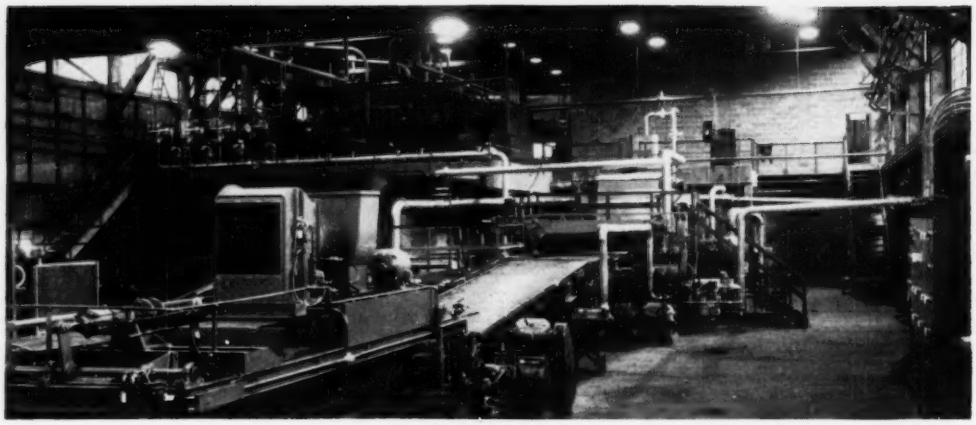
Wide Application

Among products involving straight heating or cooling now being processed with VOTATOR Heat-transfer Apparatus are: phenolic resins, formaldehyde resins, alkyd resins, melamine resins, vinyl resins, wax, viscose, rosin, printing ink, chlorinated hydrocarbons, latex, asphalt emulsions, photographic emulsions, wax emulsions, linseed oil, lecithin, gelatin, and petrolatum. Depending on the heat-transfer medium used, materials can be heated as high as 700°F, or cooled as low as -140°F.

Want Information?

Girdler's Votator Division designs and builds complete plants for processing edible oil, food, and many other products; and supplies heat-transfer equipment for continuous processing of liquid and viscous materials. Write for Bulletin V-48. The Girdler Corporation, Votator Division, Louisville 1, Kentucky. District Offices: San Francisco, Tulsa, Atlanta, New York. In Canada: Girdler Corporation of Canada Limited, Toronto.





Inside view of the Oregon Lumber Co. at Dee, Ore., which uses the ALLboard process for making hardboard from slabwood.

Hardboard From Slabwood

A CHEMICAL ENGINEERING PICTURED FLOWSHEET

High-quality hardboard for structural and decorative purposes can now be produced at low cost from the slabwood of Douglas fir and certain other species. The process uses the entire slabwood including the bark and requires no sizing agents, resins, or other chemicals. The product yield is high and the overall production cost, due to use of waste material, is comparatively low.

The new process has been perfected by A. G. Lighthall and A. B. Anderson after several years of intensive research. The Blaw-Knox Construction Co. designed and built a plant for the Oregon Lumber Co. employing this process at Dee, Ore., which has a capacity of 120,000 sq. ft. per day of ¼-in. board. The commercial feasibility of the process and its many advantages have been proved and demonstrated at this plant. Production technique has been perfected and optimum temperatures, pressures, flow rates, and other operating conditions established. The board is manufactured in thicknesses of ⅛, $\frac{3}{16}$, and ¼ in., with one smooth side. A treated hardboard can be produced for hard surface and exterior use.

In the past, it has been contended that the presence of sizable quantities of bark could not be tolerated in hardboard compositions. Lighthall and Anderson discovered that, to the contrary, the bark of certain woods contains natural extractives which can serve as binders and waterproofing agents. Because of their research work it was possible for Chemical Plants Division to design and build a plant producing an excellent hardboard in high yield from barkwood of Douglas fir and related species.

In the process, the entire slabwood including bark is chipped, cooked quickly with steam, defiberized, and converted into a free-flowing pulp. The pulp is formed on a screen and transferred to the hydraulic press where by means of the proper pressure-temperature cycle, it is converted to high-quality hardboard.

Although originally developed for the conversion of Douglas fir slabwood, it can be modified to operate successfully on other slabwoods such as Ponderosa pine, hemlock, and white fir. Other wood wastes, such as branch wood and plywood waste, can often be employed as part of the raw material. Pilot plant facilities are available for testing particular raw materials to determine their suitability.

Much of the slabwood produced in lumber mills is used for fuel, either to supply the mill with power or the slabwood is sold locally for domestic fuel. Many of these lumber mills find that their own fuel requirements are amply fulfilled by the mill waste other than slabwood, and usually there is little local domestic market for this material. Such mills have in the past disposed of their slabwood in wood waste burners. This waste slabwood can now be converted by means of the ALLBoard process into a valuable structural material.

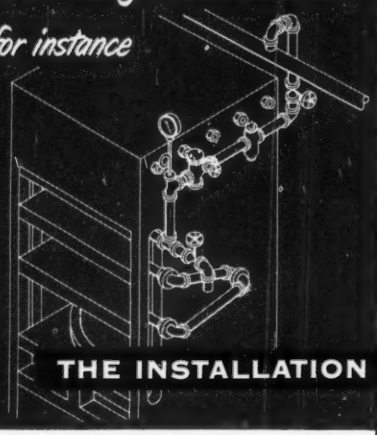
A typical untempered hardboard produced by the new process has the following specifications: modulus of rupture 5,400 psi.; density 66 lb./cu.ft.; water absorption 10 percent; swelling in water 6 percent.

Typical raw material and utility requirements for the Lighthall-Anderson process:

	For 1,000 Sq. Ft. of ¼" Board
Raw material	
Slabwood, bone dry basis	0.75 tons
green basis	1.40 tons
Utilities	
Water	2,500 gal.
Electric Power	375 kwh.
Steam	2,500 lb.
Labor	5.0 manhours

Will Your Pressure Regulators Last 25 Years?

...on Molding Press Service for instance



THE INSTALLATION

Crane Brass Pressure Regulators on steam lines to rubber molding presses; Dryden Rubber Division, Sheller Mfg. Corp., Chicago. 225 units in service.

VALVE SERVICE RATINGS

FEATURES:	Equally good on steam or air
SUITABILITY:	Steady outlet pressure - no drift
MAINTENANCE COST:	Routine servicing only
SERVICE LIFE:	Many installed more than 25 years — Still O.K.
OPERATING RESULTS:	Fully automatic steam control at lowest cost
PRICE:	Good Buy - has no equal
AVAILABILITY:	Stock item in Crane Line

THE HISTORY

Steam generated at 130 psi is reduced through individual regulators on molding presses. Pressure used at machines is 60 to 100 psi depending on work. Features of regulator service needed most are: (1) nonfluctuating outlet pressure automatically maintained within close regulation; (2) easy adjustment by press operator to specified pressure for given work.

More than 25 years ago the plant standardized on Crane Regulators, a total of 225 being in use today. Many are the original installations, still delivering desired outlet pressure. Records for all regulators, regardless of age, show no maintenance cost other than prescribed simple routine servicing. On old models of the Crane 960 regulator, after prolonged service, this includes occasional regrinding of seats.

THE VALVE

Crane No. 960 Brass Pressure Regulators reduce steam or air pressures up to 250 psi, to within 80% of inlet pressure. Factory pre-set to operate within any of 4 ranges from 1 to 200 psi, with easily selected service pressure within set range. Precision made; fully automatic; highly dependable, even under reasonable fluctuation of inlet pressure. All wearing parts renewable. See your Crane Catalog or Crane Representative for full data.

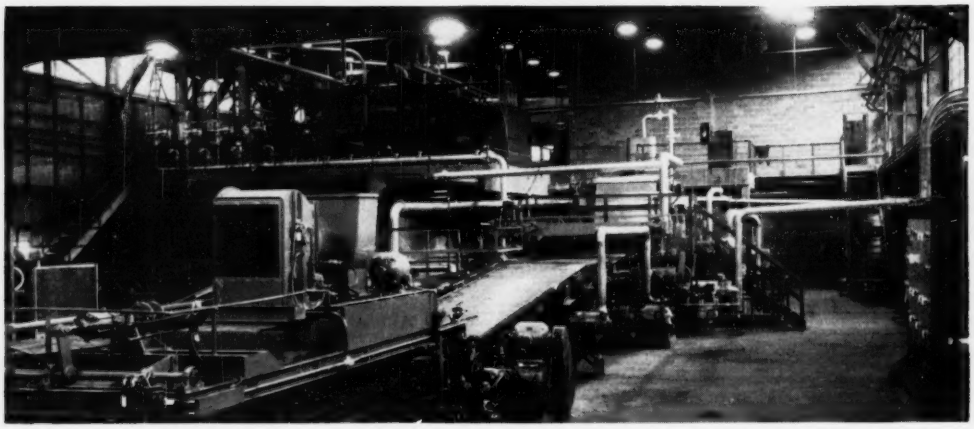
The Complete Crane Line Meets All Valve Needs. That's Why—

More Crane Valves Are Used Than Any Other Make!

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING



Inside view of the Oregon Lumber Co. at Dee, Ore., which uses the ALLboard process for making hardboard from slabwood.

Hardboard From Slabwood

A CHEMICAL ENGINEERING PICTURED FLOWSHEET

High-quality hardboard for structural and decorative purposes can now be produced at low cost from the slabwood of Douglas fir and certain other species. The process uses the entire slabwood including the bark and requires no sizing agents, resins, or other chemicals. The product yield is high and the overall production cost, due to use of waste material, is comparatively low.

The new process has been perfected by A. G. Lighthall and A. B. Anderson after several years of intensive research. The Blaw-Knox Construction Co. designed and built a plant for the Oregon Lumber Co. employing this process at Dee, Ore., which has a capacity of 120,000 sq. ft. per day of ¼-in. board. The commercial feasibility of the process and its many advantages have been proved and demonstrated at this plant. Production technique has been perfected and optimum temperatures, pressures, flow rates, and other operating conditions established. The board is manufactured in thicknesses of ⅛, 3/16, and ¼ in., with one smooth side. A treated hardboard can be produced for hard surface and exterior use.

In the past, it has been contended that the presence of sizable quantities of bark could not be tolerated in hardboard compositions. Lighthall and Anderson discovered that, to the contrary, the bark of certain woods contains natural extractives which can serve as binders and waterproofing agents. Because of their research work it was possible for Chemical Plants Division to design and build a plant producing an excellent hardboard in high yield from barkwood of Douglas fir and related species.

In the process, the entire slabwood including bark is chipped, cooked quickly with steam, defiberized, and converted into a free-flowing pulp. The pulp is formed on a screen and transferred to the hydraulic press where by means of the proper pressure-temperature cycle, it is converted to high-quality hardboard.

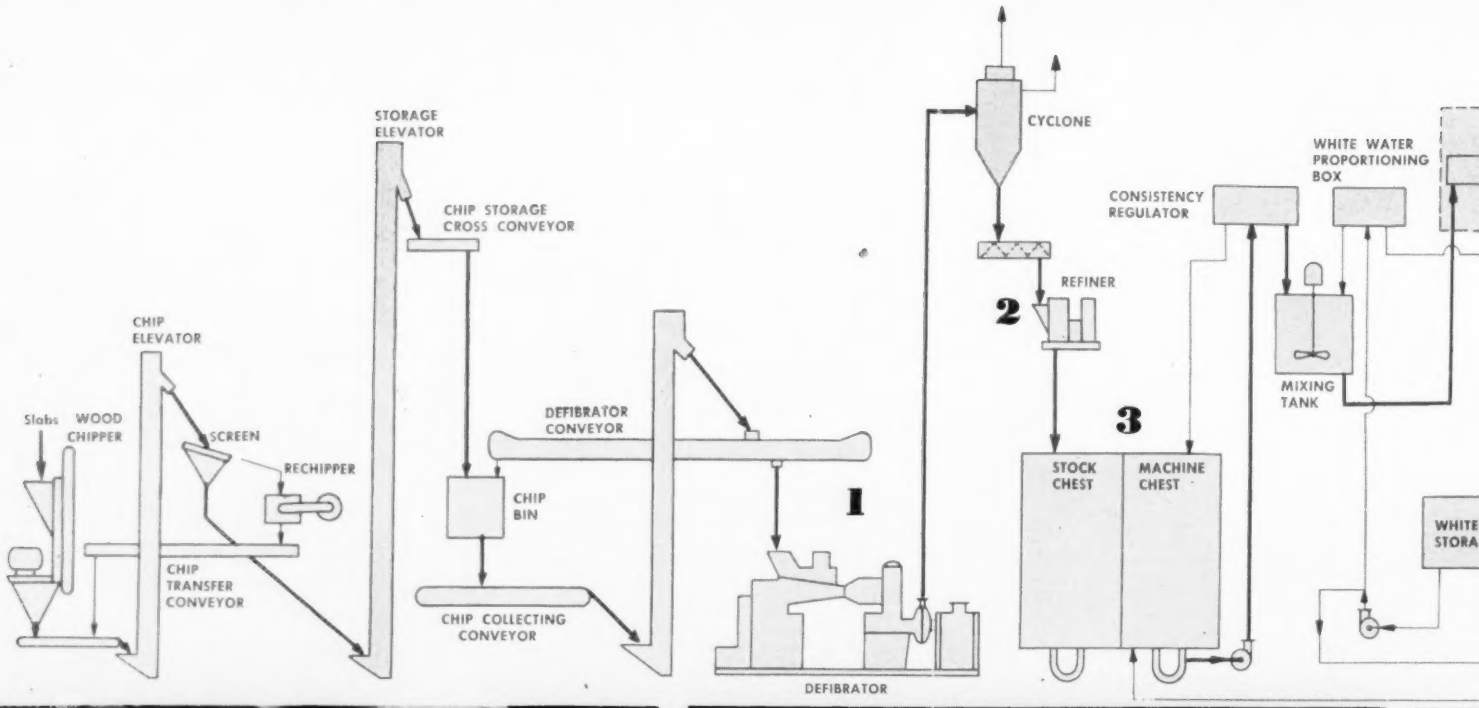
Although originally developed for the conversion of Douglas fir slabwood, it can be modified to operate successfully on other slabwoods such as Ponderosa pine, hemlock, and white fir. Other wood wastes, such as branch wood and plywood waste, can often be employed as part of the raw material. Pilot plant facilities are available for testing particular raw materials to determine their suitability.

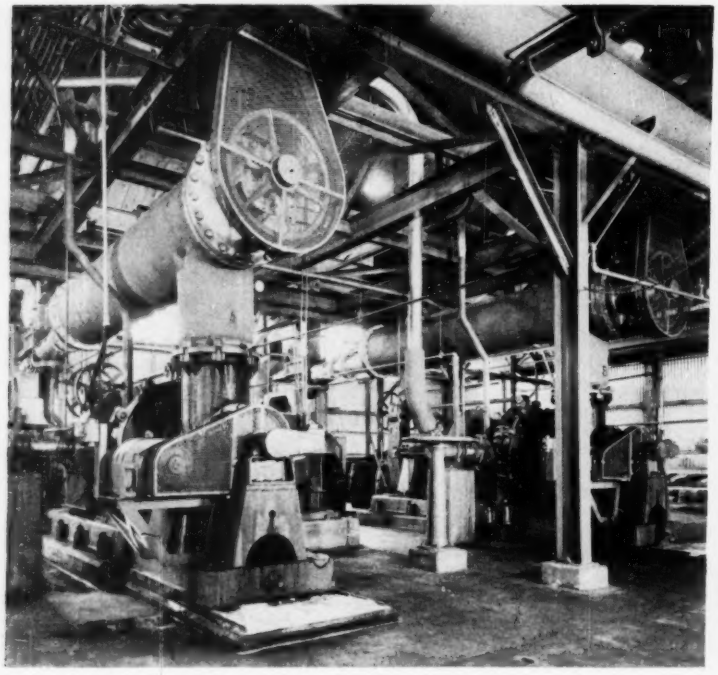
Much of the slabwood produced in lumber mills is used for fuel, either to supply the mill with power or the slabwood is sold locally for domestic fuel. Many of these lumber mills find that their own fuel requirements are amply fulfilled by the mill waste other than slabwood, and usually there is little local domestic market for this material. Such mills have in the past disposed of their slabwood in wood waste burners. This waste slabwood can now be converted by means of the ALLBoard process into a valuable structural material.

A typical untempered hardboard produced by the new process has the following specifications: modulus of rupture 5,400 psi.; density 66 lb./cu.ft.; water absorption 10 percent; swelling in water 6 percent.

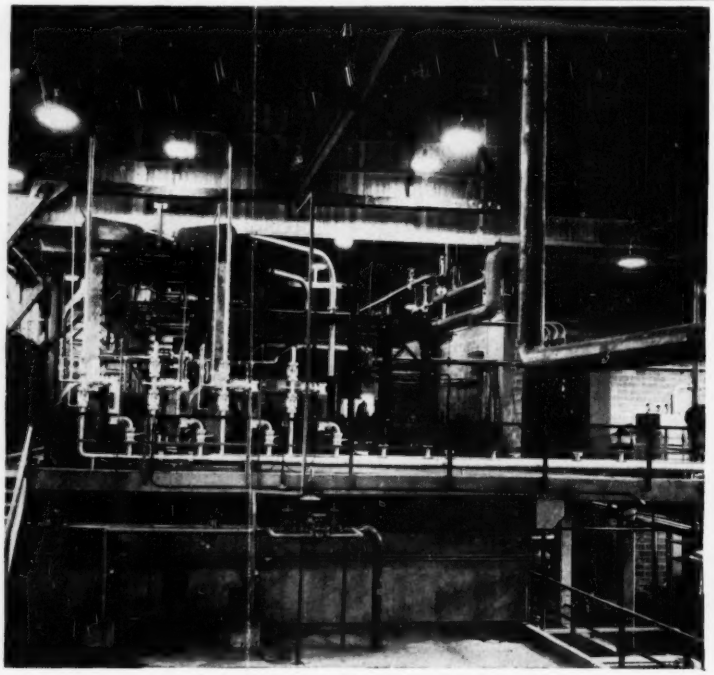
Typical raw material and utility requirements for the Lighthall-Anderson process:

	For 1,000 Sq. Ft. of ¼" Board
Raw material	
Slabwood, bone dry basis	0.75 tons
green basis	1.40 tons
Utilities	
Water	2,500 gal.
Electric Power	375 kwh.
Steam	2,500 lb.
Labor	5.0 manhours



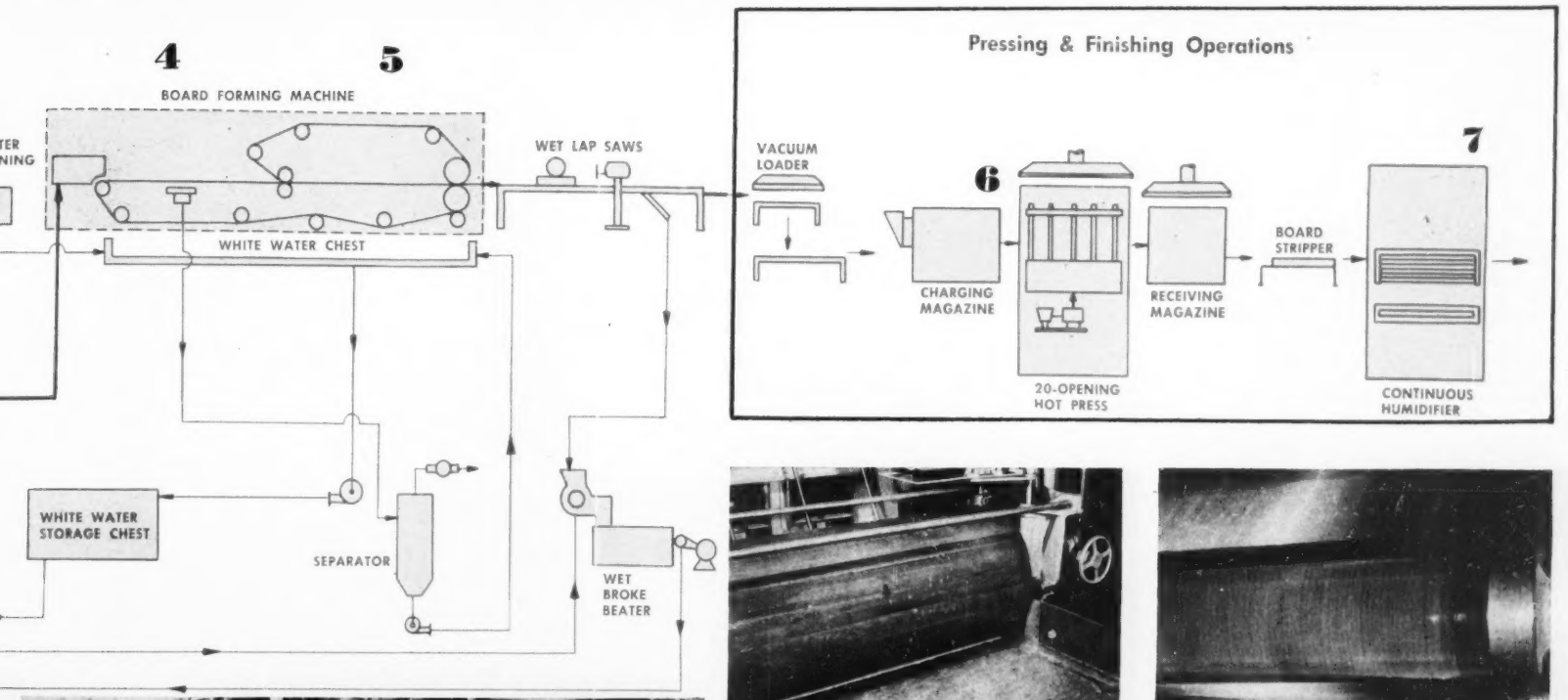


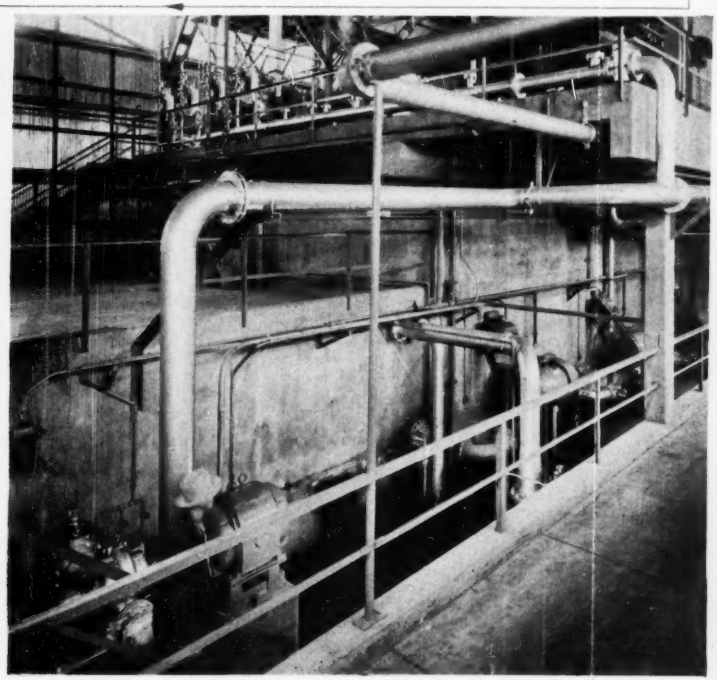
1 Defibrator where the slabwood fibers are separated under the action of steam pressure. Cyclone collects the coarse fibers.



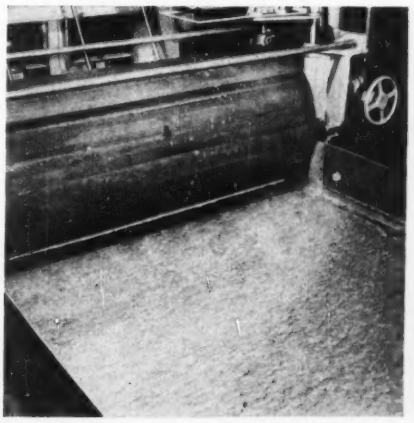
2 Refiners on this refiner deck take coarse fibers from the cyclone and with the aid of water reduce them to a pulp of the desired freeness.

3 W
ma

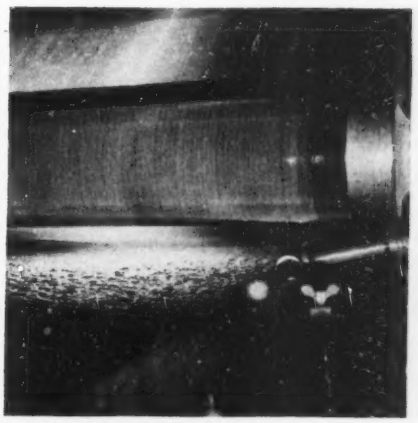




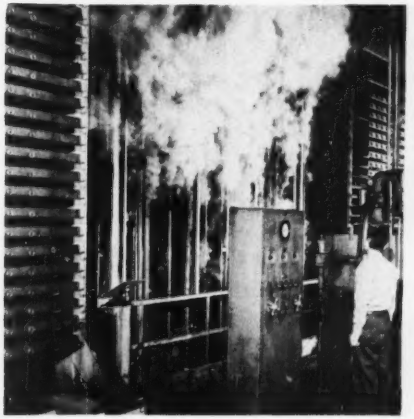
3 White water and stock chests pump and agitator bay. Stock is fed to board-forming machine after passing through consistency regulator and mixed with white water.



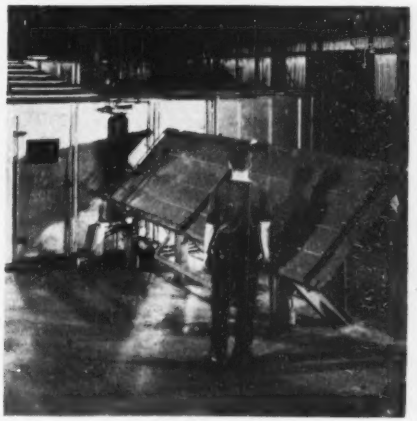
4 Fourdrinier section of forming machine showing fixed side deckle, smoother roll, formed wet lap.



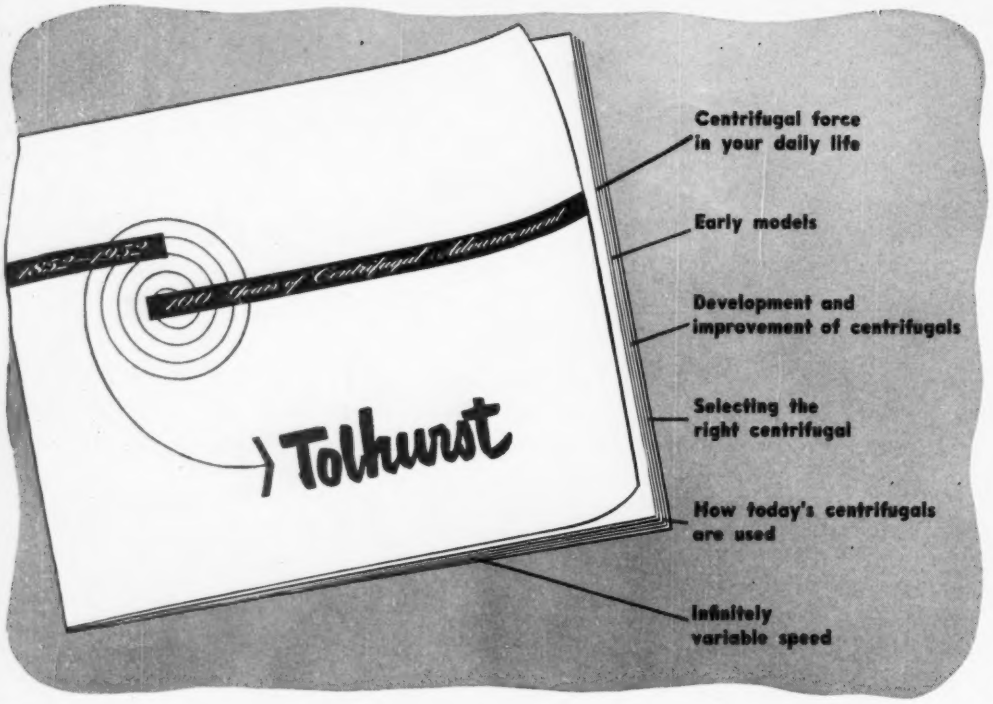
5 Fourdrinier section showing wet lap entering first roll of press section.



6 Hot press at beginning of board pressing cycle. Board has passed through vacuum loader.



7 View of continuous humidifier and tilt table at the discharge end of this unit.



Our First 100 Years Were the Hardest

IN 1852 eight years before Lincoln was elected president, Tolhurst Machine Works was founded in Troy, N. Y. Judged by today's standards, early centrifugals were crudely constructed and excessive vibration was a serious problem. When our catalog for 1885 described the new Tolhurst Self-Balancing Centrifugal as one "which will not jar the building," this development was hailed as a remarkable achievement.

In the hundred years since 1852, Tolhurst has met many problems and learned quite a little about designing and building centrifugals for American industry. If YOUR plant has a problem that involves filtering, draining, dehydrating, thickening or separating, perhaps we can help you handle it better and more economically by utilizing centrifugal force. Our experience is at your service without cost or obligation.

Highlights of Tolhurst's first hundred years have been compiled into a brochure for your library, colorfully illustrated with sketches of early events and machines as well as modern installations. To receive your complimentary copy, fill in the coupon below.

Tolhurst

CENTRIFUGALS DIVISION

AMERICAN MACHINE AND METALS, INC.

EAST MOLINE, ILLINOIS

-----Send for Your Copy Today!------

TOLHURST CENTRIFUGALS DIVISION
American Machine and Metals, Inc., Dept. CE752
East Moline, Illinois

☐ Send me a copy of the Tolhurst anniversary brochure.

☐ Have your representative call on me.

Company name _____

Address _____

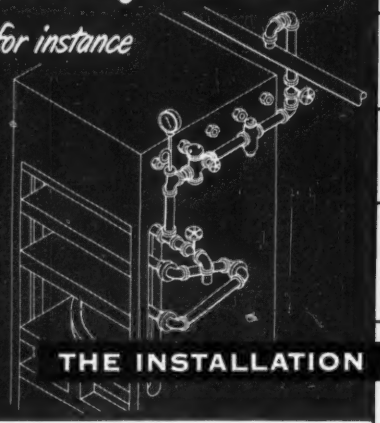
City & Zone _____ State _____

Sender's name _____

Will Your Pressu
Last 25 Years?

...on Molding Press Service

for instance



THE INSTALLATION

Crane Brass Pressure Regulators on steam lines to rubber molding presses; Dryden Rubber Division, Sheller Mfg. Corp., Chicago. 225 units in service.

THE HISTORY

Steam generated at 130 psi is reduced through individual regulators on molding presses. Pressure used at machines is 60 to 100 psi depending on work. Features of regulator service needed most are: (1) nonfluctuating outlet pressure automatically maintained within close regulation; (2) easy adjustment by press operator to specified pressure for given work.

More than 25 years ago the plant standardized on Crane Regulators, a total of 225 being in use today. Many are the original installations, still delivering desired outlet pressure. Records for all regulators, regardless of age, show no maintenance cost other than prescribed simple routine servicing. On old models of the Crane 960 regulator, after prolonged service, this includes occasional regrinding of seats.

FEAT… Equ…
SUITA… Stea…
MAIN… Rou…
SERV… Ma… 25
OPER… Full…
PRICE Good
AVAIL… Sto…

THE…
Crane No… air pressu… Factory p… 200 psi, … range. Pr… even und… wearing p… Represent…

The Complete Crane Line Meets All Valve Needs. That's Why—
More Crane Valves Are Used Than Any Other

CRANE VALVE

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illi…
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMB…

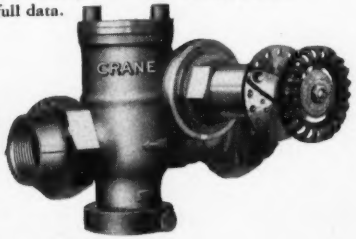
...sure Regulators

VALVE SERVICE RATINGS

FEATURES:	Equally good on steam or air
SUITABILITY:	Steady outlet pressure - no drift
MAINTENANCE COST:	Routine servicing only
SERVICE LIFE:	Many installed more than 25 years — Still O.K.
OPERATING RESULTS:	Fully automatic steam control at lowest cost
PRICE:	Good Buy - has no equal
AVAILABILITY:	Stock item in Crane Line

THE VALVE

Crane No. 960 Brass Pressure Regulators reduce steam or air pressures up to 250 psi, to within 80% of inlet pressure. Factory pre-set to operate within any of 4 ranges from 1 to 200 psi, with easily selected service pressure within set range. Precision made; fully automatic; highly dependable, even under reasonable fluctuation of inlet pressure. All wearing parts renewable. See your Crane Catalog or Crane Representative for full data.



...hy—
...Any Other Make!
...VES
...cago 5, Illinois
...Areas

PLUMBING • HEATING

Raymond SCORES AGAIN-

Flash Drying
VINYL RESINS

THE Raymond Two-Stage Flash Drying System is being sucessfully used for the handling of the various *vinyl resins.*

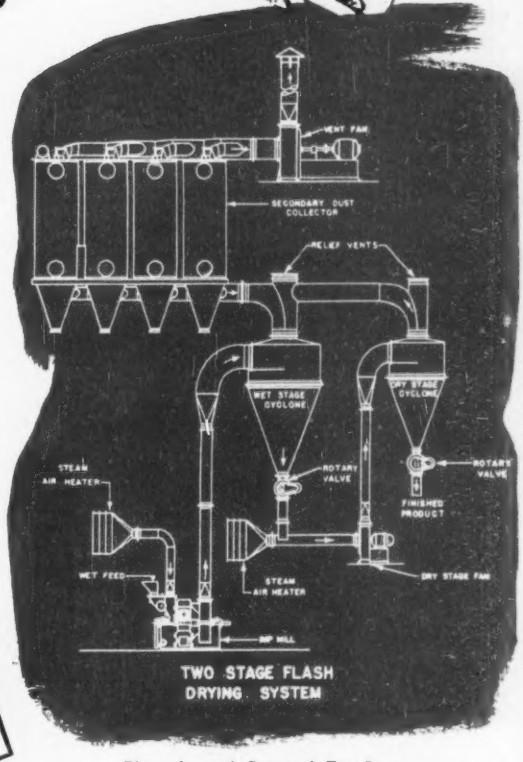
The material as fed to the Imp Mill contains 30% to 40% initial moisture, which is reduced by the flash drying action to less than ½ of one percent, even as low as 1/10 of one percent.

Disintegration is usually required in this type of operation, and the Imp Mill is used for this purpose.

Large or small Flash Drying Systems are available to suit your plant requirements. Standard or specially built equipment may be furnished with different types of construction, such as nickel or stainless steel, as your product demands.

Raymond Flash Drying has wide application in the chemical field, as it gives close product control in particle size and moisture content.

Its flexibility in installation, simplicity in operation, as well as its low cost in operation and maintenance, are advantages that may improve your present methods.



Flow sheet of Raymond Two-Stage Flash Drying System with an Imp Mill for pulverizing and removing moisture in one simultaneous operation.

seventh national chemical exposition
chicago coliseum
september 9-13
see our exhibit

For further details, ask for Catalog 54-A

RAYMOND Booth #170

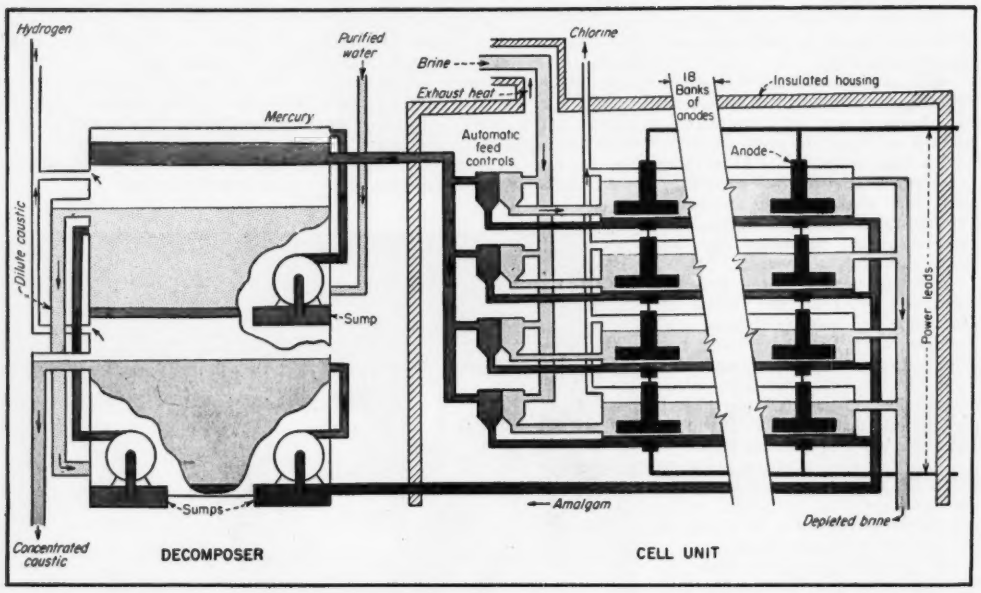
RAYMOND Flash Drying CATALOG No. 54A

COMBUSTION ENGINEERING – SUPERHEATER, INC.

1311 North Branch Street
Chicago 22, Illinois

Raymond
PULVERIZER DIVISION

Sales Office in Principal Cities



New Chlorine Cell Built in Four Layers

Latest entry in the mercury cell derby, soon to undergo pilot testing, boasts a number of features to save space, mercury, copper, power and downtime.

A new mercury cell soon to be offered to the caustic-chlorine industry utilizes a four-high stack to save space, shorten electrical connections, and reduce investment and operating costs.

This fall, a full-size unit will start operating in the Chicago shop of A. S. White, the cell's inventor. Experimental operating data to be collected will be made available to the industry.

Similar in basic theory to other mercury cells, the White cell will hinge on a novel construction idea—make use of the otherwise wasted headroom of a mercury cell installation. White will stack his cells four-high, yet the over-all height will still be less than 7 ft.

Space economy is one of the obvious advantages of such a design. A plant using these cells could apparently save up to 75 percent in cell-room area.

White anticipates another advantage not so obvious, yet extremely important—voltage losses in leads between cells are expected to be cut considerably. This is because three of every four cell-to-cell leads will be less than a foot long, compared with conventional 10 to 15-ft. leads. This reduced voltage is expected to show up in an improved power efficiency. White is looking for a power consumption of less than 3,100 kwh. per ton of chlorine when running with a current of 30,000 amp. to make slightly more than 1.0 ton per cell per day.

Any savings in power will also help reduce the investment in expensive rectification equipment.

▶ **Less Mercury**–Since one decomposer serves four cells, the inventory of mercury in the system will be significantly reduced. White's figure for this is 1,600-1,800 lb. per daily ton of chlorine capacity; this is said to be less than half that of other mercury cells. Here again is a factor which contributes to reduced investment.

Even at that, White's estimated investment figure of $5 million for a 100-ton-per-day plant seems unreasonably low. But that probably explains why some of the big names in the industry have already expressed keen interest in the development work now getting under way.

▶ **Construction Details**–Each cell will actually be split in half, so that each stack of four will contain eight split cells. The complete cell unit will be 56 in. wide and 36¼ ft. long. Each split cell will have 20 graphite anodes, 18 × 18 × 2¼ in. and weighing 45 lb. Anode life is predicted at 8 to 11 months. Cell sides will be rubber or resin-lined steel.

The unit of eight cells will be completely enclosed by an insulated housing; this feature, it is claimed, will make outdoor operation possible in many locales. The housing will also permit control of temperature within an expected range of 140-175 deg. F.

The exhaust duct from the housing

will enclose the brine inlet, preheating the brine to save on electrical energy consumption in the cell. Mercury can also be preheated by the hydrogen evolved in the decomposer to conserve energy.

A number of small but important details will appeal to production and maintenance men:

- Replacement of a cell is expected to take only an hour. As visualized, the bad cell can be disconnected, slid out on a dolly (no crane required) and a spare cell slid in. Meanwhile a jumper switch will feed current to the other seven cells in the stack, without interrupting production. The bad cell could be repaired in the shop and held as a spare.

A circuit breaker in the feed-rate controller will break the current in the brine and mercury streams, preventing energy loss and allowing the rest of the system to be grounded.

- Inlet and outlet end parts (manifolds, fittings, gaskets, end plates) will be interchangeable. Parts will be jig-and-fixture made, certain to fit.
- Cells will be gas-tight, reducing corrosion and air contamination problems. Even if a leak should occur, the housing is expected to confine it until repairs could be made.
- Cells will not require sloping to get gravity flow, can be installed level more easily than cells requiring sloping.
- Because one decomposer serves four cells, there will be fewer pumps and motors to maintain.

▶ **How It Will Work**—Operation of the cell is expected to be simple, requiring little technical skill. A competent operator can be trained in a comparatively short time, says White. He describes the cell operation as follows:

Incoming brine, preheated by exhaust from the cell housing, enters feed-rate controllers. Brine is fed into each cell automatically to maintain the proper level.

No current flows through the brine until it enters the cell, where the usual breakdown to chlorine and sodium occurs. Sodium amalgamates with mercury; the amalgam is drawn off into a manifold and passes to the decomposer. Depleted brine also leaves through a manifold for replenishment.

Amalgam flows to the first sump, is pumped into the lower decomposer chamber beneath a layer of strong caustic. Stripped of most of its sodium, the amalgam collects in the second sump, is pumped into the upper decomposer chamber under the surface of dilute caustic. Scrubbed of its last traces of sodium, the mercury collects in the third sump and is pumped to a storage chamber.

Purified water fed into the upper chamber becomes dilute caustic while scrubbing the last traces of sodium from the mercury. Overflowing from this chamber, dilute caustic drops into the bottom of the lower chamber, scrubs the sodium-rich incoming mercury, overflows as strong caustic.

Feed rates of brine and mercury will be automatically controlled to avoid being affected by variations in line pressure or head from supply tanks. Brine level will be adjustable to give more room for chlorine, increase pressure, or increase brine: mercury ratio for different amalgamation conditions.

As with other mercury cells, caustic purity depends on water purity. With pure water 50-73 percent rayon-grade caustic can be had without additional evaporation.

This cell can also be set up to give both caustic and sodium sulphide, or caustic can be eliminated and only sodium sulphide produced. This feature should be of special interest to the paper industry.

RESEARCH TEAM that developed the new Upjohn process for cortisone.*

Cortisone by Fermentation

A new fermentation process, developed by researchers of the Upjohn Co. of Kalamazoo, Mich., promises more and cheaper cortisone. In a single step, the process bypasses a series of costly and complex chemical operations.

President Donald S. Gilmore of Upjohn says that with the new process such abundant raw materials as yeast, Mexican yams or soybean products can be used.

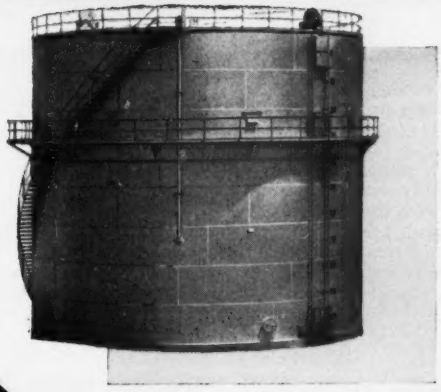
Upjohn is marketing its cortisone at 20 percent below the prevailing price of about $30 per gram to the consumer. At present, Upjohn markets cortisone as 25-milligram tablets packed 20 to the bottle.

Key problem in the partial synthesis of cortisone is the adding or shifting of an atom of oxygen in the complex molecule to the critical C-11 position.

Up to now, cortisone has been produced from desoxycholic acid, a component of cattle bile, by what is probably the most intricate series of chemical steps in any commercial process. At first, it took 37 steps to produce cortisone from desoxycholic acid. Since then, improvements have increased the yield and cut the steps to about 20.

Discarding other possible approaches, Upjohn researchers finally

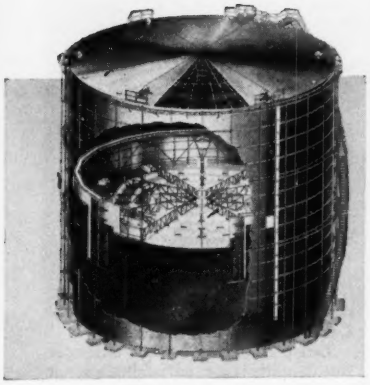
* The team, from left to right: L. M. Reineke, Dr. R. H. Levin, Dr. D. H. Peterson, Marian H. Leigh, Dr. Adolph Weintraub, Dr. H. C. Murray and Dr. P. D. Meister. Other members, not shown: Dr. S. H. Eppstein and Dr. R. B. Edwards.

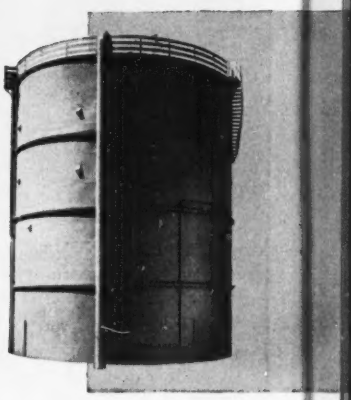


SIMPLICITY

EFFICIENCY

ECONOMY





Wiggins Gasholder by GENERAL AMERICAN

. . . that's what you get when you specify WIGGINS GASHOLDERS for chemical process and industrial gases.

The absolutely dry, frictionless seal of the WIGGINS GASHOLDER is gas-tight and impermeable. Can't freeze or "hang up" —there's *no* water—*no* tar—*no* grease. *No* complicated mechanism. *No* gadgets. *No* operating costs. *No* maintenance costs.

Ask us about installations made from coast to coast for economy-minded process engineers—men who *know* that the Simplicity of the WIGGINS GASHOLDER in operation *always* results in Efficiency and Economy.

Send for Bulletin WG-22! It's written for you!

WIGGINS VAPOR SEALS GENERAL AMERICAN TRADE MARK

GENERAL AMERICAN TRANSPORTATION CORPORATION
135 South La Salle Street, Chicago 90, Illinois
Offices in all principal cities

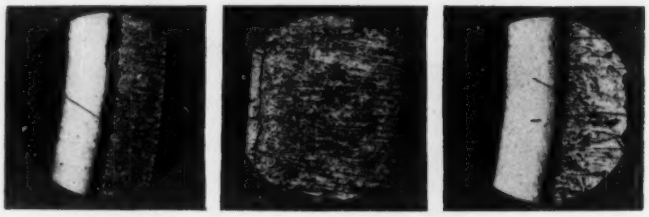
decided that the best route to cheap and abundant cortisone was a fermentation process, instead of the costly chemical process.

One of the first things the cortisone research team had to do was devise a new method of paper chromatography to tell quickly just which hormones were produced by their fermentation process and how close these hormones were to the eagerly sought cortisone.

There were thousands of possible molds to be screened. But the break came when a growth was spotted in a petri dish that had been set beside an open window to pick up mold samples. The mold was of the genus *Rhizopus*, which is of the *Mucoraceae* family of the order *Mucorales*—which includes many common bread molds.

This mold, when placed in a "soup" — a lactalbumin digest-dextrose-cornsteep medium—with starting materials from soybeans, yeast or Mexican yams (stigmasterol, ergosterol or diosgenin respectively), converts the starting materials into intermediate steroids with an oxygen atom in the C-11 position.

The new fermentation process has important ramifications in the whole field of steroid production. The Upjohn process is adaptable to production of such cortical steroids as hydrocortisone and corticosterone.



Crystallinity in aluminum deposits, left, is controlled by periodic reverse current, center, or by addition to the bath of β,β'-dichloroethyl ether, right.

New Bath Refines Aluminum Uses

A new type of organic plating bath provides dense, ductile deposits of the metal, suitable for a number of exacting applications not possible before.

The National Bureau of Standards has just come forth with a practical process for electrodepositing aluminum at room temperature. Developers D. E. Couch and Abner Brenner expect it to be useful for electroforming articles with close inside tolerances and for putting thin protective coatings of the metal on all sorts of small equipment.

Until now commercial aluminum has been in the fused state, unsuitable for electroplating or electroforming. It's been made at a high temperature from a bath of fused cryolite and aluminum oxide.

In the NBS process, an ethereal solution of aluminum chloride and a metal hydride deposits aluminum. The best deposits come from an ethyl ether solution, 2 to 3 M in aluminum chloride and 0.5 to 1.0 M in lithium hydride. Deposits are ductile, 0.5 to 0.75 mm. thick with hardnesses of from 37 to 97 Vickers. Rates of 0.025 to 0.05 mm. per hr. are possible.

Bureau researchers turned up this aluminum bonus while trying to develop practical methods for deposition of metals like molybdenum, tungsten, titanium and zirconium. They'd been studying both fused salts and baths of organic solvents.

▶ **Some Clear Sailing**–The new process sails around many old bugaboos. Aluminum is too far above hydrogen in the electromotive series to be deposited from aqueous solutions which always contain some hydrogen in ionized form. Electrodeposition from nonaqueous solutions has been tried before with only moderate success. The procedure was too difficult for practical applications and the deposits were lacking in purity and ductility.

Investigators got best results from their new process when the ether was free of water and alcohol. Otherwise, more lithium hydride must be used, and bath life is shorter.

Plating baths are usually made from reagent-grade aluminum chloride. Technical aluminum chloride yields operable baths but, again, a larger amount of lithium hydride is required. Also the hydride precipitates insoluble material, probably metallic impurities, which must be filtered.

To insure dryness a glass plating vessel with a tight polyethylene lid is used. A central hole with a rubber stopper allows anodes of aluminum rod to pass through the lid. Objects to be plated, the cathodes, can also be inserted and removed through it.

If hermetically sealed, the bath keeps for several weeks. However, under ordinary operating conditions, the solution slowly deteriorates giving streaked and brittle deposits.

Care must also be taken to keep the lithium hydride content above 3 or 4 gm. per l. Otherwise the deposits become hard, brittle and grey rather than white, mat and ductile.

▶ **Don't Stir Up Trouble**–Agitation of the bath is unnecessary. In fact it even causes some roughness of the deposit by stirring up sediment.

Cathode and anode efficiencies for the process are approximately 100 percent. Deposits 0.05 in. thick have been prepared at the bureau. Thicker deposits should be possible if the sharp edges of the cathode are shielded to prevent treeing.

Current densities may be as high as 4 or 5 amp. per sq. dm. However, if thick deposits are wanted, the current density should not be greater than 2 amp. per sq. dm.

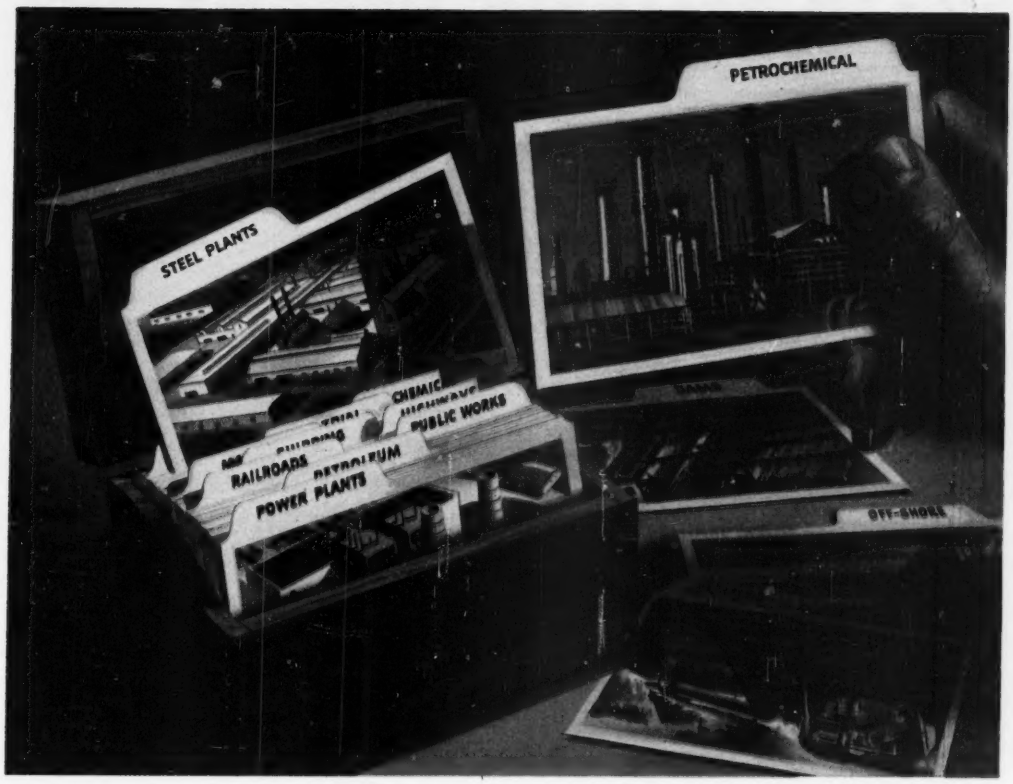
Large, columnar crystals characterize deposits (see cut) obtained at lower current densities. Periodic reverse current prevents the deposit (see cut, center) from becoming coarsely crystalline and reduces treeing. Smooth, sound deposits 0.75 mm. thick have been produced but they are harder and less ductile than those made with direct current.

NBS investigators found they could reduce crystallinity even further by adding β,β'-dichloroethyl ether. A concentration of 4 to 8 percent results in a very fine grain structure (see cut).

Pitting–which frequently occurs in aqueous baths–is practically non-existent in this ether bath.

Due to the high concentration of the aluminum chloride in the ether the bath is not as dangerous or as flammable as would be expected. The atmosphere above the solution in a closed bath contains ether vapor therefore, all electrical connections to the bath must be made with the current off so there will be no chance of arcing.

A number of different ethers have been tried in place of ethyl ether in an attempt to develop a less volatile and less flammable bath. But none yielded as satisfactory deposits.



BROWN & ROOT'S VERSATILITY CAN SAVE YOU DOLLARS AND DAYS

Almost two decades of diversified experience in heavy industry construction and engineering has developed Brown & Root specialists in every field. Their combined experience can be translated into faster, more economical completion of your proposed project.

Repeat awards of contracts to Brown & Root by the biggest firm names in industry is your assurance that a Brown-Bilt job is well done!

If you contemplate new construction or expansion of your present plant, a call from you will put Brown & Root planning experts at your disposal.

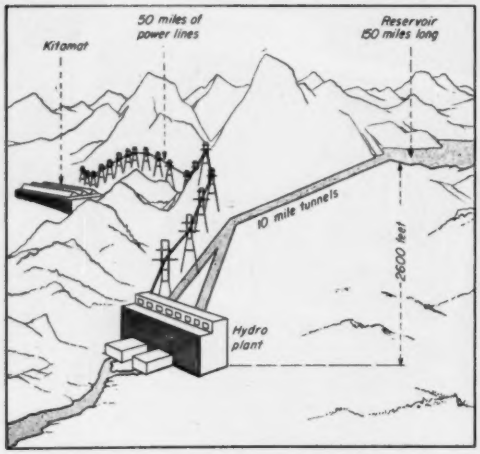
BROWN-BILT

BROWN & ROOT, Inc. *Engineers • Constructors*

P. O. BOX 3, HOUSTON 1, TEXAS

CABLE ADDRESS — BROWNBILT

Associate Companies:— BROWN ENGINEERING CORP. • BROWN & ROOT MARINE OPERATORS INC.



Installations in Alcan's huge aluminum project: smelter at Kitamit, power transmission route, 10-mi. tunnel to . . .

. . . hydro plant, site of which is at right foreground, will be underground for safety.

Aluminum Colossus Rises in B.C.

World's biggest aluminum smelter supplied by low-cost electric power—progress toward that goal is well under way despite terrific engineering problems.

By 1954 Aluminum Co. of Canada's smelter now abuilding in Kitimat, B.C., will be in operation. Already the company has made firm commitments for the production of 100,000 tons annually.

And this only represents the first stage, $160 million worth, of the development. Ultimately a capacity of one billion pounds may be reached, $500 million spent. Under way a year, the project ranks along with Alberta oil as one of the two biggest developments in western Canada since the railroads went through.

▶ **Why Take the Trouble**—Large-scale aluminum production revolves on almost unbelievable quantities of nearby electric power. The most modern process now known requires about 10 kwh. to make one pound of metal. And the B. C. wilderness has an abundance of wasting waters said to be the source of the most economical hydro power in the world. That's why Alcan elected to struggle with the titanic engineering and construction problems of the location.

They justify the expense and trouble with the fact that since World War II the demand for aluminum has exceeded present world capacity. Over the past 25 years consumption has increased 9 percent cumulatively per year, with the probability that the growth trend will continue upward.

▶ **Five Big Jobs**—In addition to the smelter itself, the four other projects involved in the vast effort are:

1. A tremendous powerhouse, that will generate 420,000 hp. installed capacity, inside a mountain at Kemano. Hewn from solid rock, the cavern, 1,400 ft. within the recesses of the mountain, will be about 1,000 ft. long, 100 ft. high. Main reasons for the underground location: it will not be subjected to landslides; it is less vulnerable to possible attack from the air; it makes the arrangement of the very high pressure pipes leading to the turbines more feasible.

Eventually an installed capacity of 2,240,000 hp. will be developed if circumstances warrant. Power produced will exceed that of any single generating plant ever built.

2. A huge dam to combine a dozen large lakes and a myriad of smaller ones into a huge reservoir with a surface area of 335 sq. mi. Until the dam is completed, a diversion tunnel built last summer has completely changed the course of the Nechako River.

3. Two 10-mile tunnels of 25-ft. diameter through the coast mountains to drop the water down 2,600 ft. to the Kemano powerhouse.

4. A transmission line to carry the power from the Kemano powerhouse, up the Kildala Valley and over an elevation of 5,000 ft. to Kitimat at the head of the Douglas Channel 50 miles to the northwest of the powerhouse.

The big job is on schedule. The task of backing water for the dam began last fall and will take two and one half years to complete. When the huge cavern to house the power facilities is excavated, Canada will have its first underground power plant. More than 200,000 tons of steel, 24,000 tons of aluminum and 4,000 tons of copper will be consumed by the project.

Within a year Kitimat should have a population of 7,000 and expansion to an ultimate 50,000 persons will be provided. New roads and a new port will open up this hitherto closed area.

Ocean boats will bring in alumina to Kitimat for processing into aluminum. British Guiana will supply the bauxite which will be semi-processed at Jamaica. A saving will thus be made in shipping space as it takes 4 lb. of bauxite to make 1 lb. of aluminum, as against only 2 lb. of aluminua to one of aluminum.

THE FOURTH DICALITE PLANT

...will add approximately 80% increased production capacity for Dicalite calcined and processed filteraids and fillers

The new plant of the Dicalite Division, Great Lakes Carbon Corporation, at Lompoc, Calif., is now in volume production at a continually increasing rate. It represents over 5 years of engineering, design and construction, and is the largest complete unit for processing diatomite built in the last 22 years. Full designed output will add approximately 80% increased production capacity for Dicalite calcined and processed filteraids, fillers and other materials.

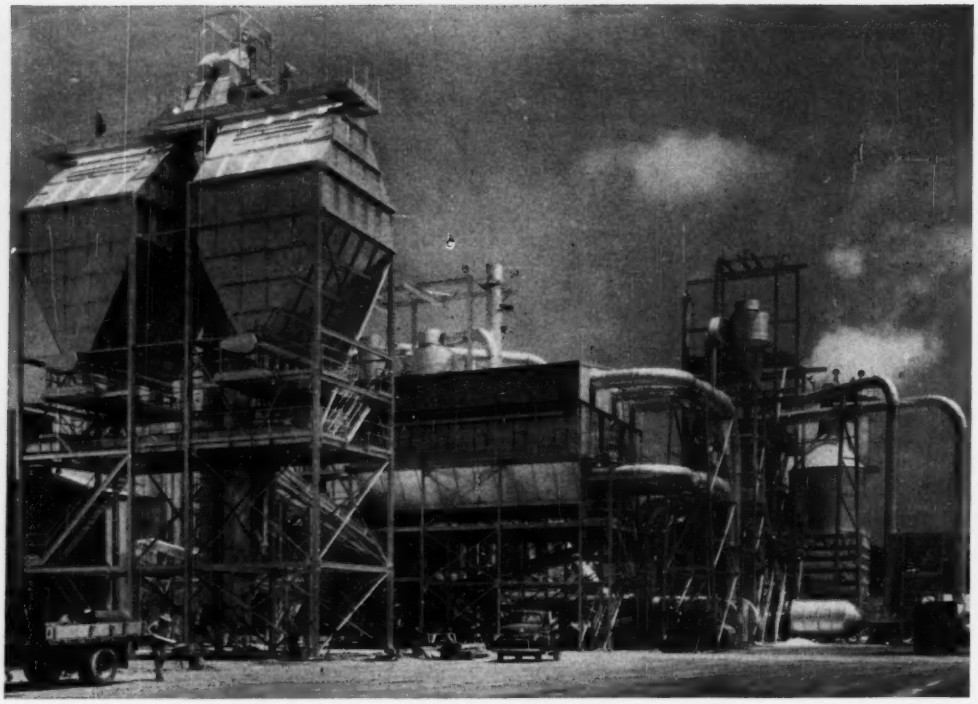
The timing is fortunate in view of the emergency situation in the supply of diatomaceous products. Four Dicalite plants are now running 24 hours a day to produce the maximum tonnage of Dicalite materials.

Advanced design of the new plant has afforded greater operating flexibility. Even during this extreme pressure for volume production, specifications for performance and quality of each product are readily maintained. Research data are being accumulated to aid in developing new and improved Dicalite products for future industrial use.

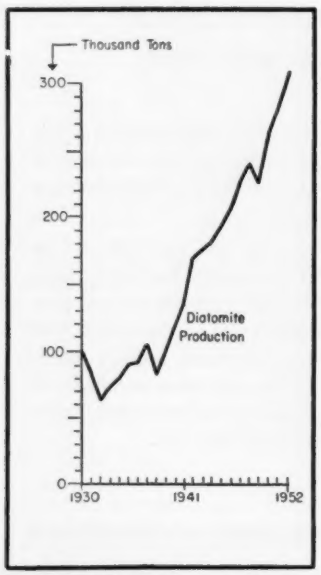
DICALITE DIVISION GREAT LAKES CARBON CORPORATION

GLC

NEW YORK 17 • CHICAGO 1 • LOS ANGELES 17



Mechanized Plant Means More Diatomite



PRODUCTION of diatomite in the U. S. (An estimate based on triennial totals.)

California's new $2.7 million diatomite plant is a model of mechanization in minerals processing. Already it has operated at 50 percent above its rated capacity.

That means that the process industries—biggest users of diatomaceous silica—can now get more of this versatile filter aid, extender and insulating material.

In spite of skyrocketing production (see chart) demand for diatomite has outstripped the supply for well over a year. Dicalite (a division of Great Lakes Carbon Corp. of Chicago) recently had a backlog of orders covering more than three months' output, including full capacity of the new plant.

But with Lompoc, Dicalite now hikes its total capacity of diatomite by 70-80 percent. The Los Angeles firm, a producer since 1930, can now turn out upwards of 190,000 tons yearly from its four plants. Walter Gramm, senior vice president of Great Lakes, points out that the new Lompoc plant "is the largest complete unit for processing diatomite built in the last 22 years."

► **Engineering Features**—Some engineers look upon the Lompoc unit as one of the best examples of modern, streamlined engineering in the field of non-metallic minerals processing. Much of the credit for this goes to S. W. Martin, vice president in charge of engineering development.

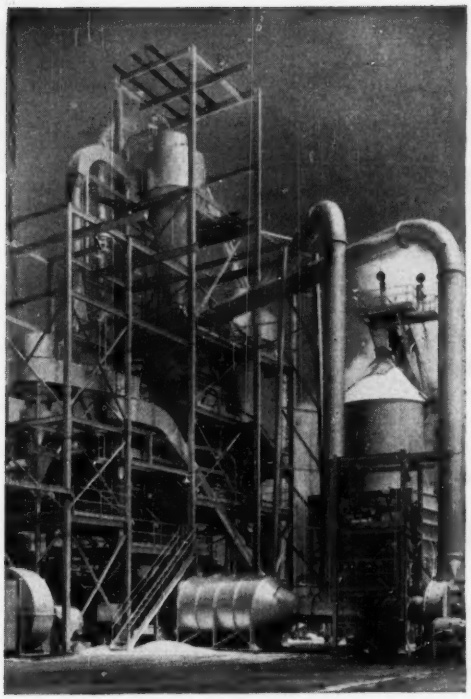
Processing steps—drying, milling, calcining, air classifying, packaging—are pretty much the same as those already described for other diatomite operations.* The process proper boils down primarily to taking out impurities (air separation) and to sizing the diatom particles (air classification).

But Lompoc has engineering refinements that make it stand out:

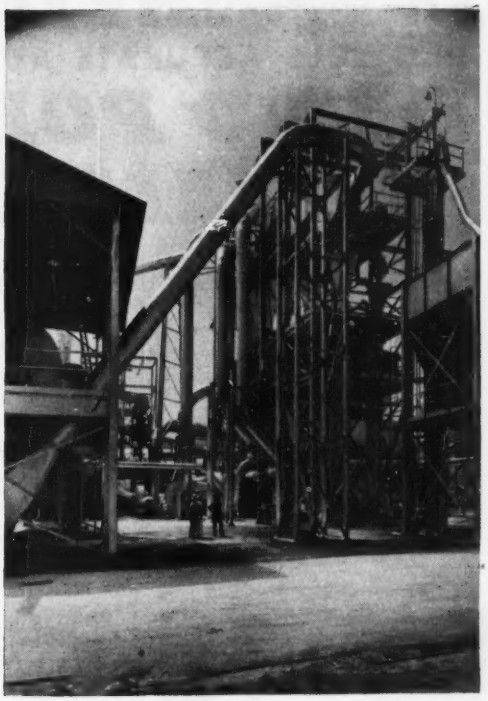
• A completely automatic centralized control system for monitoring all process steps; labor needs have been cut just about in half.

---

* *Chem. & Met. Eng.*, Jan. 1938, pp. 28-31; Aug. 1942, pp. 110-113.



CYCLONES are used to air-separate impurities and products.



KILN is used to calcine products that are classified here.

• An elaborate dust control setup that increases safety, cuts down losses and minimizes air pollution.

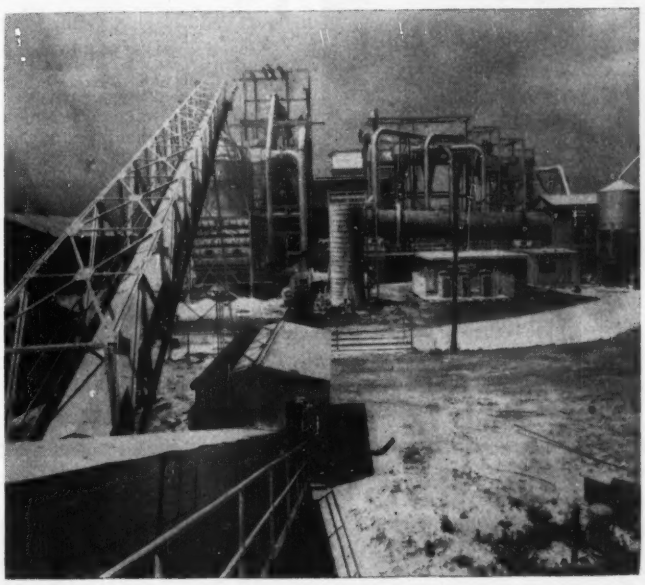
• A highly mechanized materials handling system; from storage bin up to box car loading, the material is moved by air.

• Open-air construction that has reduced dust hazards, lowered both construction and maintenance costs.

▶ **Control Systems**—Main feature of the plant is a centralized control system monitoring all process steps. The system, completely automatic and interlocking, controls stream flow and direction, activates a siren and identifying light when any blower, valve or conveyor fails, halts all operations behind any stoppage.

An electric eye in the baghouse sounds an alarm when any one of the Orlon stockings recovering fines from the air stream breaks. Dicalite estimates that its control system has halved the number of men required for processing.

Also featured is an elaborate dust control setup. A centrally located, plant-sized vacuum cleaner pulls in



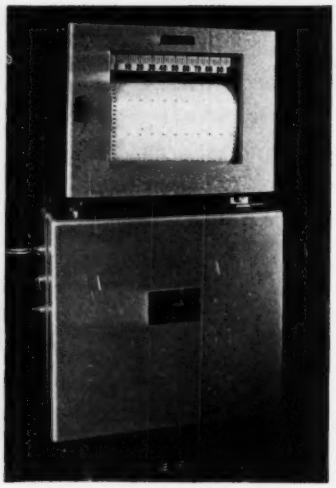
BELT conveyor here can move 10 tons of crude diatomite per hour to hammermill.

INFRARED
PROVIDES ACCURATE AUTOMATIC
END POINT ANALYSIS for

ACETYLENE →
- Acrylonitrile
- Acetaldehyde
- Acetic Acid
- Vinyl Chloride

ETHYLENE →
- Ethylene Glycol
- Ethylene Oxide
- Ethanol
- Ethylene Dichloride

with the



PROCESS CONTROLS PLANT STREAM ANALYZER

- The decisive factor in the economic success of a process is product quality and yield.
- End-point analysis for concentration variations is a reliable index of product quality and yield.
- Through end-point control, the results of such analyses can be used to provide automatic and continuous correction of the process variables.
- For these reasons, end-point analysis and its control application have become of major significance to the process engineer.
- The PROCESS CONTROLS Plant Stream Analyzer is specifically engineered for end-point analysis and control applications.

WRITE TODAY FOR BULLETIN 36

PROCESS CONTROLS

a division of Baird Associates, Inc.

33 UNIVERSITY ROAD CAMBRIDGE 38, MASSACHUSETTS

PLANT is located at Lompoc, Calif.

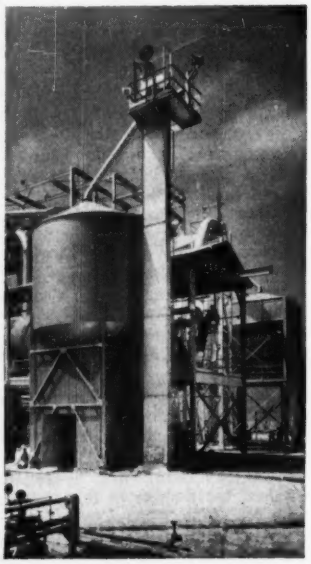
dust from 15 outlets located throughout the processing area.

Five of the outlets are in the packaging and warehouse building—three pick up dust at the bagging station, one acts as a conveyor hood (4 nozzles blow 20-psi. air over the filled bags into the hood) and one picks up dust at the press where palletized bags are squeezed to remove entrapped air and reduce shipping bulk. Orlon bags at the central unit clean the air, gather the dust for disposal as waste.

The plant's open air nature also expedites dust control. While most of Dicalite's Walteria, Calif., plant is enclosed in two huge buildings, at Lompoc the only enclosed operation is the bagging of finished products, Operations Manager Edward A. Harris points out. This not only reduces dust hazards but slashes construction and maintenance costs as well.

All materials handling operations except box-car loading have been completely mechanized.

A surge conveyor, for example, takes care of any bags that come to the



KILN turns out a calcined product.

How to keep informed on the "with what" part of your business

AT YOUR FINGER TIPS, issue after issue, is one of your richest veins of job information – advertising. You might call it the "with what" type – which dovetails the "how" of the editorial pages. Easy to read, talking your language, geared specifically to the betterment of your business, this is the kind of practical data which may well help you do a job quicker, better – save your company money.

Each advertiser is obviously doing his level best to give you helpful information. By showing, through the advertising pages, how his product or service can benefit *you* and *your* company, he is taking *his* most efficient way toward a sale.

Add up all the advertisers and you've got a gold mine of current, on-the-job information. Yours for the reading are a wealth of data and facts on the very latest in products, services, tools . . . product developments, materials, processes, methods.

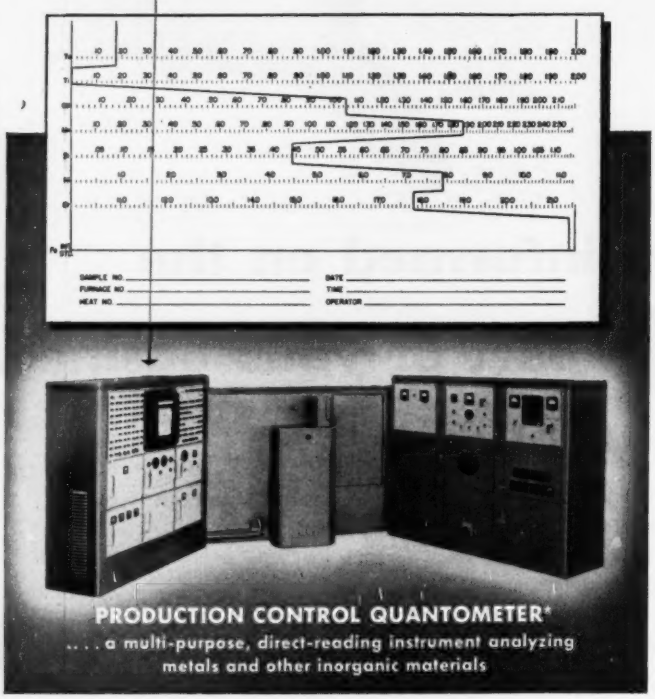
You, too, have a big stake in the advertising pages. Read them regularly, carefully to keep job-informed on the "with what" part of your business.

McGRAW-HILL FOR BUSINESS

McGRAW-HILL PUBLICATIONS

THE INSIDE STORY ON STAINLESS STEEL

Shown below is a multiple-copy graphic record of a typical stainless steel chemical analysis made on an ARL Production Control Quantometer.* Accurate percentages of elements present in the alloy are recorded permanently in pen-and-ink in less than two minutes! And steel is only one of many metals and inorganic compounds which the unique ARL Quantometers are controlling daily as to routine chemical analysis in many types of industries.



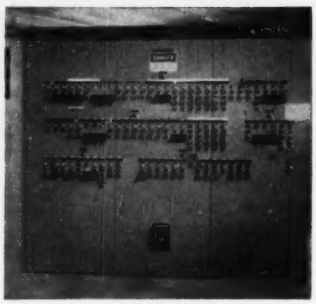
The ARL Quantometer is extremely efficient, versatile and applicable to a wide variety of needs. Individual units are not limited to a single type of analysis, but can be designed to meet the requirements of many plant problems. As many as 25 elements as selected by the user can be accurately measured on the Production Control Quantometer—up to 20 simultaneously!

This instrument, pioneered and perfected by ARL engineers, is invaluable in helping to speed the production of critical materials and improving laboratory controls. It is the most advanced type of spectrometer yet developed and deserves your most serious consideration. Write for descriptive brochure.

THE ARL LINE ALSO INCLUDES 1.5 AND 2-METER SPECTROGRAPHS, PRECISION SOURCE UNITS, RAMAN SPECTROGRAPHS AND RELATED ACCESSORIES.

Trademark*

Applied Research Laboratories
SPECTROCHEMICAL EQUIPMENT
3717 PARK PLACE • GLENDALE 8, CALIFORNIA
NEW YORK • PITTSBURGH • DETROIT • CHICAGO • LOS ANGELES



CONTROL system is automatic.

press too fast to handle. With a press of a button the operator can reverse the conveyor and take as many bags as needed from the reservoir. Eventually box-car loading will be mechanized, too.

Improved milling blowers, greater flexibility in air-classification and increased versatility in shifting from one product to another—refinements such as these, company engineers say, should go a long way toward giving Dicalite better products at a lower cost.

▶ **Where It Goes**—Dicalite's new plant will turn out the company's three general types of diatomite products:

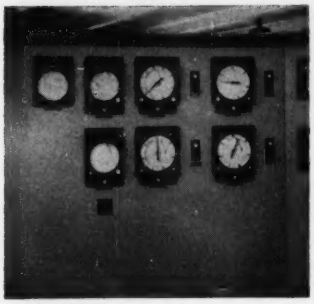
- Natural: dried, milled, and air classified;
- Calcined: dried, milled, calcined at high temperatures, air classified;
- Process Calcined: dried, milled, subjected to high-temperature fluxing, air classified.

These products, says R. L. Douglas in Los Angeles, are used to produce items ranging from silver polish to streptomycin.

Major uses, as Douglas classifies them, are these: (1) as filter aids to speed up the clarification of food products, pharmaceuticals and chemicals; (2) as insulating materials for high temperature boilers and furnaces; (3) as paper aids to speed production and to improve quality and appearance; (4) as a flatting and extender pigment for paints, varnishes, and other protective coatings.

The unusual physical properties of diatomite (actually the siliceous skeletons of diatom algae deposited under marine conditions millions of years ago) account for its widespread use in industry.

And these uses have been growing at a fast clip, too. Last year, for example, some 290,000 tons of diatomite was used in the U. S.—just about double the tonnage a decade ago, four times that for 1932.



INSTRUMENTS are on three panels.

But with its new plant, Dicalite intends to pace its output to the growing demands.

Nor is the company worried about reserves, either. The Lompoc reserves—now the largest developed diatomite deposit in the world—have an estimated 67 million tons of high-grade diatomaceous earth. At the current rate of consumption, that's enough to last some 115 years.

Government to Retain Control Over Synthetic Rubber Plants

Government controls over the U. S. rubber industry almost certainly will be extended for 21 months. The House has passed a bill extending controls for that period and sent it to the White House. The President was expected to sign it.

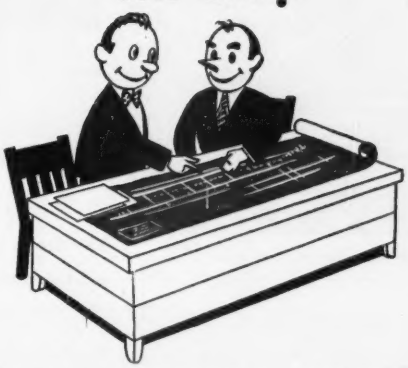
The measure would extend the Rubber Act from June 30, 1952, until March 31, 1954. It empowers the government to run the synthetic rubber plants and to prescribe the minimum amounts of synthetic rubber that must be produced and consumed each year. It also contains authority for controlling imports of rubber and putting other controls on that product.

The President would have to give Congress by April 15, 1953, a plan for returning the synthetic facilities to private industry. The RFC must prepare a plan and report on it to Congress and the President by March 1 next year. The President, in turn, must submit his report and recommendation by April 15.

The new measure is a compromise between an original House bill, which would have extended the Rubber Act for two years, and a bill approved by the Senate for a one-year extension. The compromise was worked out by a House-Senate conference and has the approval of both the Senate and the House.

TIPS ON SOLVING DRYING PROBLEMS

JUST HOW DOES CONSULTING PROCTOR ENGINEERS EARLY PAY OFF?



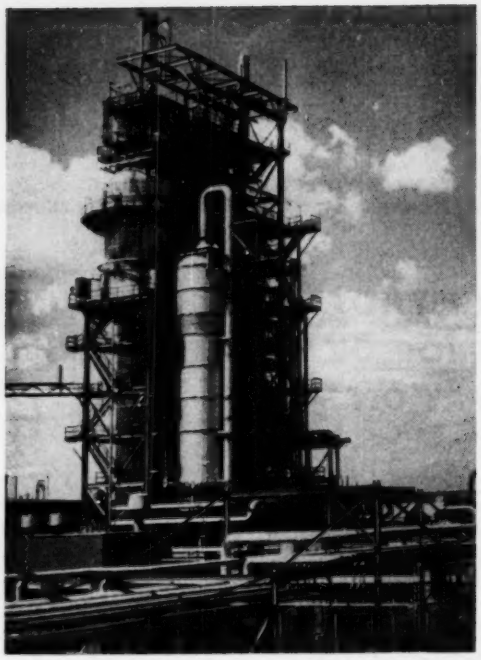
Taking Proctor engineers into your confidence just as soon as you know that drying is to be a part of your processing line usually pays off in substantial savings—for you! It makes such plain common sense when you stop to think about it. When drying is a part of a process it is usually a vital link. As such, the equipment should be considered at the very outset of your planning. Its design is dependent upon a number of factors . . . the capacity desired and physical characteristics of the product being two of the chief considerations. Proctor engineers may recommend that to obtain a desired capacity, the product be delivered to the dryer in a certain state and this may govern the type of preliminary equipment needed. Then too, characteristics of the dried material may affect the type of subsequent equipment you will need. That is why it is advisable to consider the problem—as a whole and early! You save time, effort and money by consulting Proctor engineers early. Write today for Bulletin 361 for the complete story of the Proctor approach to solving drying problems. For a lucid explanation of Proctor Drying Systems for the Process Industries, ask for Bulletin 342 as well.

A FEW TYPICAL MATERIALS BEING DRIED IN PROCTOR CONTINUOUS CONVEYOR SYSTEMS

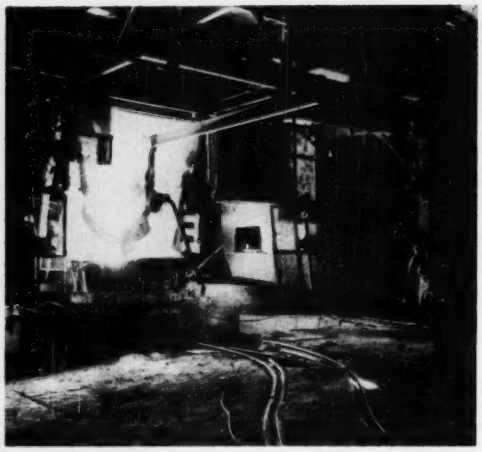
Starch
Titanium Dioxide
Sulfa Drugs
Calcium carbonate
Magnesium carbonate
Clay
White Lead
Finished Lithopone
Soy Bean Protein
Lead Arsenate
Nitro Guanidine

PROCTOR CONTINUOUS CONVEYOR SYSTEMS

PROCTOR & SCHWARTZ INC • 711 TABOR ROAD • PHILADELPHIA 20 • PA •



PETROCHEMICALS: Six fluid cat crackers since 1948, five more abuilding. That shows the fast pace of refinery growth.



CARBIDE: Biggest producer in British Commonwealth is Shawinigan Chemicals, now adding 100,000 tons annually.

Canada's Chemical Boom

It quickens industrialization of our northern neighbor as pulp and paper, metals and especially petrochemicals expand.

Since the end of World War II Canada has become the third most industrialized country in the world, its population up 25 percent to more than 14 million. Chemical industry, especially petrochemicals, has grown dramatically.

▶ **Chemicals**—In a decade, Canada's chemical industry has added 215 new plants, a 26 percent gain; it has taken on 15,000 new workers, an increase of 52 percent; it has lifted the value of the products it sells by $342 million—a hefty 228 percent.

This dramatic growth of Canadian industry, particularly petrochemicals, "surpassing anything experienced in wartime," is explained by Vice President John D. Fennebresque of Celanese Corp. of America as partly due to "comparatively moderate income tax laws" and "sagacious" long-range policy on use of natural resources.

Finding technical men to staff Canada's mushrooming chemical industry is getting harder. Starting salaries for new graduates are edging closer to the $325 a month that U. S. companies average. Canada, warns Dr. Garnet T. Page of Ottawa, general manager of the Chemical Institute of Canada, may even have to seek technical men from other countries.

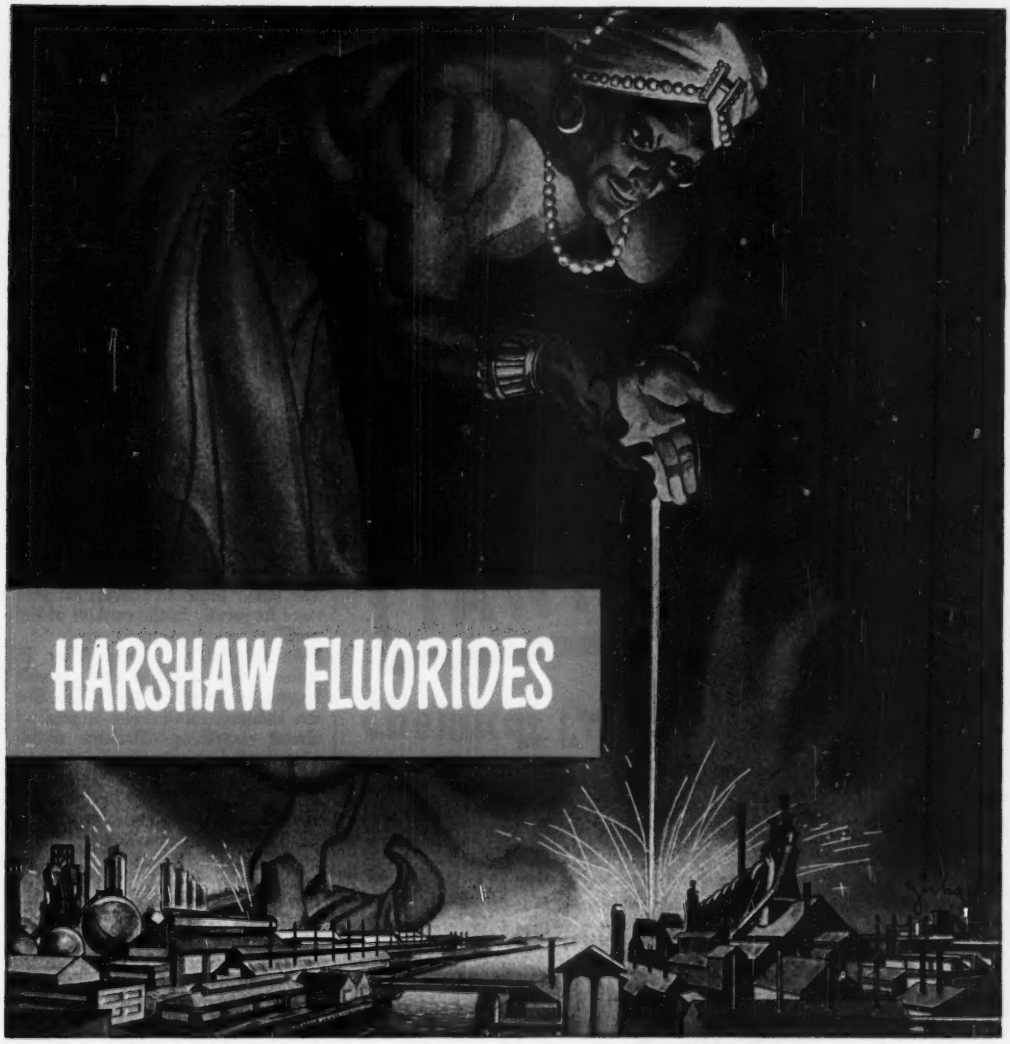
Marketing the mounting output of chemicals poses still another problem, according to R. Stephen Jane, vice president of Montreal's big Shawinigan Chemicals, Ltd., and new president of the Chemical Institute. Canada's chemical industry needs foreign markets. Potentially, the market for Canadian chemicals is tremendous, but, in the U. S. especially, high tariffs make it hard to get at the market.

What has caused this boom of Canada's industry?

▶ **Transportation**—Modern transport, for one thing, has opened vast areas. Mining engineers can now get out the immense resources of northern Canada, and this mineral

(Continued on page 280)

PULP AND PAPER: Canada's leading industry, with 130 mills turning out products valued at over $1 billion a year.



the MAGIC GENIE of industry

• Like the magic genie of old, Harshaw Fluorides work capably and efficiently for many industries. They are used advantageously in numerous operations. The top ranking of Harshaw Fluorides is the result of rigidly controlled uniformity and quality.

THE HARSHAW CHEMICAL CO.

1945 E. 97th Street • Cleveland 6, Ohio

CLEVELAND • CINCINNATI • DETROIT • HOUSTON • LOS ANGELES • PHILADELPHIA

A comprehensive group of Harshaw Fluorides is listed below

Ammonium Bifluoride	Hydrofluoric Acid Aqueous
Ammonium Fluoborate	Hydrofluosilicic Acid
Antimony Trifluoride Sublimed	Inorganic Fluorinating Agents
Barium Fluoride	Potassium Bifluoride
Bismuth Fluoride	Potassium Chromium Fluoride
Boron Trifluoride	Potassium Fluoborate
Boron Trifluoride Complexes	Potassium Fluoride
Chromium Fluoride	Potassium Titanium Fluoride
Fluoboric Acid	Silico Fluorides
Fluorine Cells	Sodium Fluoborate
Fluorinating Agents	Zinc Fluoride
Frosting Mixtures	
Hydrofluoric Acid Anhydrous	

Available upon request . . . M. C. A. Safety Data Sheets SD-25 and H-10 furnishing essential information for safe handling and use of hydrofluoric acid.

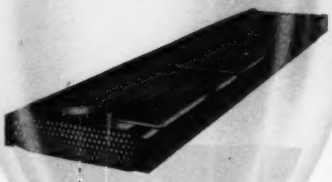
Progress Measured in the Sands of Time

50 YEARS

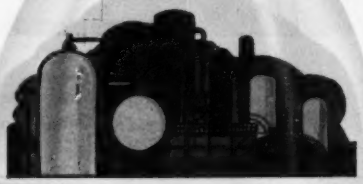
YEARS OF CHEMICAL PROCESSING INDUSTRIES

45 YEARS

YEARS OF SERVICE TO THOSE INDUSTRIES



You've counted on us in the past . . . count on us also in the future. At this Chemical Processing Industry half-century mark, we at Western again pledge the same convenience of service . . . the same excellence of engineering standards . . . the same top quality of fabrication for All your heat transfer problems. For the next 50 years . . . CONSULT WITH WESTERN.



WESTERN
HEAT EXCHANGERS

Manufactured by
WESTERN SUPPLY COMPANY
P.O. BOX 1888 TULSA, OKLAHOMA

wealth can be carried to world markets at competitive prices. Air transport and modern road construction are making remote areas accessible to industry and are greatly reducing the cost of bringing out raw materials.

▶**Power**—Another factor underlying the present boom is cheap power. Huge dams and hydroelectric plants have been constructed on Canadian rivers, providing industry with power to process raw materials near their source.

Discovery of oil in western Canada tapped still another source of power. The oil is piped from the Edmonton area to the head of the Great Lakes and shipped by tanker to the refineries and chemical plants of Ontario and Quebec.

Significantly, these new sources of power have enabled Canada to establish her own secondary industries. Raw materials once sent to the United States for processing now remain in Canada for manufacturing. The label "Made in Canada" is seen more frequently in the markets of the world.

▶**Arsenal**—During World War II, with normal sources cut off, Canada became an arsenal of the Allies. She was suddenly called upon to produce almost everything. Strategic metals were needed at once.

After the war, Canadian industry held to its high level of production. No postwar recession occurred. Instead, industrial expansion continued unchecked.

▶**Aluminum**—At Kitimat, an obscure Indian village on the northwest coast of British Columbia, a huge power plant and aluminum smelter is being constructed. The greatest aluminum development in Canada, it's expected to double Canadian production. Kitimat may eventually become a city of 50,000. Canada is the world's leading exporter of non-ferrous metals, much of them mined in British Columbia.

▶**Hydro Potential**—At present, British Columbia uses only one-tenth of her estimated hydroelectric potential of 11¼ million horsepower, but with expansion of the lumbering and pulp and paper industries, with mining developments and the Celanese plants, new power lines are being strung across the province.

▶**Gusher**—An oil strike at Leduc, reminiscent of those in Texas and Oklahoma, is gradually changing Alberta from a farming province to a rich industrial area. The black gold from the prairies flows through a pipeline 1,127 mi. long to the head of the Great Lakes. An $83 million pipeline when completed will carry oil from Edmonton to Vancouver.

Oil derricks and steel storage tanks have become part of the prairie landscape. Oil men say only the surface has been scratched and that prospects are tempting in Saskatchewan and in northern Alberta's Athabaska tar sands.

▶**Uranium**—The magic metal, now so prized, is mined at Port Radium on Great Bear Lake in the Mackenzie River area. Canada is the world's second largest producer of uranium. The richest deposits of uranium are located at Beaverlodge in the northwestern corner of Saskatchewan; they're rapidly being developed.

In 1920 a few cabins marked the site of Flin Flon in northern Manitoba, where now there is a thriving mining community of nearly 10,000. Copper and other base metals are mined in this area. Sherridon, another mining town to the north of Flin Flon, where deposits had been worked out, has been literally moved north to the new mining area at Lynn Lake. The houses were hauled 155 mi. through the forest by tractor train. A railway is now being extended to Lynn Lake.

Northern Ontario is one of the key mining areas in Canada. The Timmins-Kirkland Lake section, scene of fabulous gold strikes in the '20s, is the major gold mining region. At Cobalt, where the famous Silver Sidewalk lode was discovered in 1905, a revival is in progress, with cobalt being mined for new uses such as jet engines.

In northwestern Ontario new iron mines are being exploited at Steep Rock Lake. Most of the world's nickel comes from the Sudbury area.

Manufacturing has stimulated the growth of large cities in southern Ontario. Aircraft plants, steel mills, blast furnaces and textile mills are multiplying.

▶**Iron and Titanium**—Northern Quebec's rivers make possible the development of hydroelectric power, and the abundance of cheap power is the key to Quebec's industrial progress.

Ungava iron is one of the exciting ventures in Quebec today. In the remote hinterland of the Ungava Peninsula iron reserves greater than those of the Mesabi range in the United States have been uncovered. Soon flat cars will be carrying the iron ore down the new railroad to the docks at Seven Islands on the St. Lawrence, and hence to blast furnaces in the United States and Canada.

Electric power makes possible the big smelting plant of Quebec Iron & Titanium at Sorel, where the second and third of five electric furnaces are just getting into operation. In the furnaces, ore rich in iron and titanium is smelted with coal to produce iron

"Goodbye! To Product Contamination ...I've got Acid-Proof TANTALUM

Chemical Processing Equipment

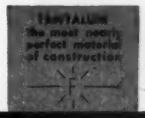
"In making a high purity product such as ours, we can't take chances on picking up contamination from partly corroded equipment. Tests showed that tantalum is safe. Experience proved that tantalum is economical."

TANTALUM,
The Acid-Proof Metal

1. Acid-Proof means inert, not merely "resistant."
2. Full speed in heat transfer.
3. Freedom from thermal shock.

Manifold type heat exchanger used in distilling c. p. HCl. One of these units has been in service since 1938.

USE TANTALUM WITH ECONOMY
for most acid solutions, corrosive gases or vapors; not with HF, alkalis or substances containing free SO_3.



Acid-Proof TANTALUM

22405C

Fansteel Metallurgical Corporation NORTH CHICAGO, ILLINOIS, U.S.A.

MADE OF TEFLON

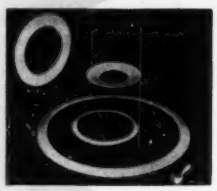
CHEMISEAL GASKETS

ARE IMPERVIOUS TO

ACIDS, CAUSTICS, SOLVENTS

*Teflon's inertness to all chemicals, excepting molten sodium and fluorine, has become so well known that Chemiseal Gaskets have become standard for corrosion and contamination problems throughout industry.

Chemiseal Teflon-jacketed gaskets are available in any size, with a variety of filler materials suitable for glass, glass-lined, porcelain-lined, Carbate, Haveg or metal piping and equipment. These fillers are protected on both faces and the inside diameter by the chemical resistant Teflon jacket.



Solid Teflon cut gaskets are available either as ring or full face gaskets for all standard pipe sizes or for irregular shaped openings. Solid Teflon gaskets ⅛" thick generally can be used wherever a ⅛" compressed asbestos gasket would be mechanically suitable.

Sheet Teflon for cutting your own gaskets for field emergencies, is available in thicknesses from ⅛" and in standard sheet sizes up to 36" square. Write for catalog or send blue prints for special gasket requirements.

UNITED STATES GASKET COMPANY

UGS

FLUOROCARBON PRODUCTS DIVISION

FABRICATORS OF TEFLON, KEL-F AND OTHER FLUOROCARBON PLASTICS

CAMDEN 1, NEW JERSEY

*duPont's trademark for its tetrafluoroethylene resin

and a slag containing titanium dioxide. The ore comes from deposits at Lake Tio in Quebec. Products go by rail to the Montreal-Hamilton area or by ship to ports on the U. S. east coast. Quebec Iron & Titanium is jointly owned by Kennecott Copper and New Jersey Zinc.

▶**Pulp and Paper**—The Maritime provinces, four in all since the inclusion of Newfoundland in 1949, are sharing in the industrial boom. A big volume of Canada's pulp and paper is produced in New Brunswick and Newfoundland.

On Cape Breton Island, coal is mined under the sea, and its byproducts will be used in a new chemical industry in Nova Scotia.

▶**Rapid Rise**—How fast is Canada becoming industrialized? In 1918, agriculture provided 44 percent of the total net value of commodity production, compared with 33 percent for manufacturing. Today, agriculture accounts for only 23 percent, while manufacturing is 52 percent.

New sources of cheap power and a rapidly increasing home market have stimulated Canada's industrial expansion. Canadians have found they can produce and process their own goods and compete successfully with industry in other countries. The economy of the nation is changing and the potentialities for future development are almost unlimited.

Canada's history has been that of pioneering a new and difficult country. Canadians are turning a vast wilderness into an industrial nation, and chemical industry is in the forefront of the enterprise.

New Chlorophyll Unit Uses Kennedy Extraction Process

A $1 million chlorophyll plant will be built at Lamar, Colo., for National Chlorophyll & Chemical Co., new firm set up by National Alfalfa Dehydrating & Milling Co. to conduct its chlorophyll production activities.

The new plant will be adjacent to National Alfalfa's present Lamar facilities, and will add 4,000 lb. of chlorophyll per month to its production capacity.

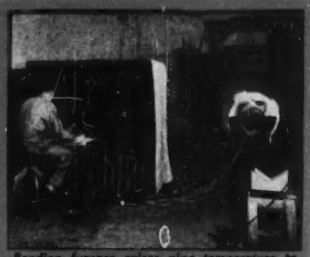
The plant, which will be built by Vulcan Copper & Supply Co., will include facilities for processing of crude extract to get finished chlorophyll for industrial, pharmaceutical and medicinal uses.

Chlorophyll from alfalfa meal will be refined by solvent extraction, using the Kennedy continuous countercurrent extraction system developed by Vulcan.

What it takes to make steam behave *at 1450 psi and 1000° F!*

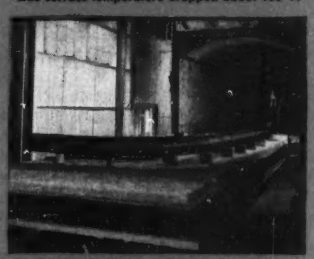
MAIN STEAM PIPING INSTALLED AT SALEM HARBOR STATION OF NEW ENGLAND POWER COMPANY

Manufacture of this main steam piping began at Pennsylvania Forge Corporation as 20-ton alloy-steel ingots (2½% chrome, 1% moly steel). Four days' forging changed the ingots into solid bars 30 ft. long, with outside diameter of 15½ in. Boring, turning, sizing and finishing followed.

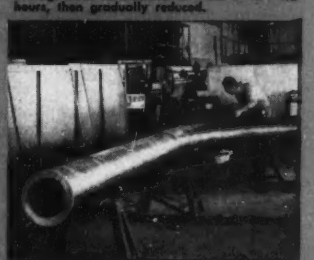


Bending furnace raises pipe temperature to 2000°F in 3 hours, 40 minutes. Thermocouples and pyrometer measure pipe temperature.

Skilled team completes bend in six minutes. Inside surface temperature dropped about 100°F.



Bend being loaded into furnace for stress relieving. Heat maintained at 1425°F for 4½ hours, then gradually reduced.



Ultrasonic inspection of wall after cleaning of pipe shows maximum thinning in bend of 1/16 inch.

FABRICATION of the main steam line for the Salem Harbor Station of the New England Power Company, vital link in more than 52 miles of piping fabricated by Grinnell, is an example of the *many* skills required of Grinnell piping specialists. Grinnell chemists, metallurgists, physicists, radiologists and supersonic electronic scientists... *all* played a part in the bending, welding and testing operations.

The integration of complex, highly technical skills like these into a *single* organization of trained specialists explains Grinnell's leadership in the field of prefabrication. It explains, too, why your interests are best served when you call upon Grinnell's expert personnel and specialized facilities in the solution of your piping problems.

GRINNELL

WHENEVER PIPING IS INVOLVED

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

Cominco Photo

PHOSPHATE fertilizer: Keeping supplies up hinges on sulphur.

SUPERPHOSPHATE:

Can 208 Plants Hold the Line?

What's our superphosphate production potential? How well are plants set up to operate during the sulphur shortage? USDA gives the facts and figures.

Best industry estimates for 1952 are that we'll have 6 percent less than the 11 million short tons of 18 percent superphosphate turned out in 1951.

Yet the latest production figures for this year belie that gloomy forecast, show a rise of 38,000 tons for the first quarter of '52 as compared with the first quarter of '51.

National Fertilizer Association points out that the only limiting factor in superphosphate production is the supply of sulphur and sulphuric acid. Need and demand for fertilizers is at an all-time high. Present capacity is well over 16 million tons; right now, some 208 superphosphate plants are operating, six more than last year.

The U. S. Dept. of Agriculture has just completed a comprehensive survey of the superphosphate and wet-process phosphoric acid industries for 1950 and 1951. They took on the job because of three important developments: (1) the growth of phosphate fertilizers since World War II and the expected increase in demand; (2) the shortage of sulphuric acid, basic to the production of 90 percent of the country's available phosphoric oxide (P_2O_5) as fertilizer; (3) the AEC's interest in wet-process phosphoric acid as a source of uranium.

Here are some highlights of the study (for a more detailed report see next month's *Chemical Engineering*).

- Late in 1951, there were 202 normal superphosphate plants in the continental U. S. These are distributed among 32 states. Greatest concentration is in the South Atlantic region where there are 71. Georgia is first with 29.
- Eight plants manufactured wet-base goods in 1951, as compared with seven in 1950. Production of wet-base goods was entirely at plants that also manufactured normal superphosphate.
- Ninety-one of the normal superphosphate plants have coexisting facilities for making sulphuric acid.
- Florida phosphate rock was used exclusively in 191 plants, Tennessee rock in 4, and western rock in 5. Two plants used both Florida and Tennessee rock.

▶ **Productive Capacity High**—In late 1951, the total yearly capacity of the 202 normal superphosphate plants was 16,537,745 tons of material containing 18 percent available P_2O_5. Capacity is based on a work year of 300 two-shift days, with adequate supplies of rock and sulphuric acid as well as ample storage facilities.

About 84.8 percent—or 14,028,545 tons—of this capacity is in plants east of the Mississippi.

Total storage facilities for normal superphosphate amount to 2,321,700 tons—about one-seventh of the total productive capacity. The ratio of storage to productive capacity varies from about 1 to 9 in the East and West North Central regions to about 1 to 4 in the Mountain-Pacific region.

Data on the growth of the industry from 1941 to 1951, although not entirely comparable, indicate a rise of 38.4 percent in the number of plants and an increase of 96 percent in the annual productive capacity. The total number of plants with coexisting acid facilities increased by only 19.7 percent

Data on the actual output for the year ending June 30, 1951, showed that the average plant produced 59.1 percent of rated capacity. The figures ranged from 5.1 to 171.0 percent for the individual plants.

▶ **More and More Sulphuric**—The industry used a total of 3,156,495 tons of sulphuric acid (100 percent) in 1950, latest year for which figures are available. Manufacturers used 2,883,119 tons of virgin sulphuric acid to manufacture 91.6 percent of the normal superphosphate produced in 1950. Of this, 2,410,382 tons came from elemental sulphur. All but 4 of the 91 plants with coexisting acid facilities made acid from elemental sulphur only.

Fumes and gases from roasting and smelting non-ferrous metals were the source of at least part of the virgin acid for 37 normal superphosphate plants. Three of these plants had coexisting sulphuric acid facilities and the total acid production of one of these three plants was from sulphur from this source.

Only nine plants reported use of acid from pyrites. One of these had coexisting acid facilities and a portion of the acid came from this source.

Spent acid accounted for only 8.7 percent of the total quantity of acid used to manufacture normal superphosphate in 1950. Spent acid was used in 43 plants in amounts ranging from 0.5 to 100 percent of total acid requirements of the plant. Four plants operated on spent acid entirely.

▶ **Status of Triple Super**—In 1950, nine plants produced 645,885 tons of run-of-pile triple superphosphate, equivalent to 660,134 tons of material averaging 45 percent available P_2O_5. Data on 1952 production so far indicate a total production between 700,000 and 750,000 tons (basis: 45 percent APA).

Seven of these plants are making phosphoric acid by the sulphuric acid

process (five produced H_2SO_4 in coexisting facilities; and one, TVA, by the electric-furnace process).

The amount of rock acidulated with phosphoric was 274,122 tons.

In terms of 50 percent H_3PO_4, 80 percent of the phosphoric acid used to acidulate phosphate rock was made by the wet process and 20 percent by the electric-furnace process. The 126,519 tons of electric furnace acid contained a small amount of spent furance acid.

▶ **Wet Process Acid**—Phosphoric acid was made by the wet process in 13 plants in 1950. Seven of these had coexisting facilities for making triple superphosphate.

Total output of wet-process acid (basis 50 percent H_3PO_4) was 879,215 tons. Of this, 490,952 tons went into triple superphosphate.

▶ **Fluorine Recovery**—In 1951, 22 plants had facilities for recovering fluorine from phosphate rock. Two of these were wet-process phosphoric acid plants; one produced both wet-process acid and normal superphosphate and 19 were normal superphosphate plants.

Chemstrand Will Market Its New Acrylic Fiber This Fall

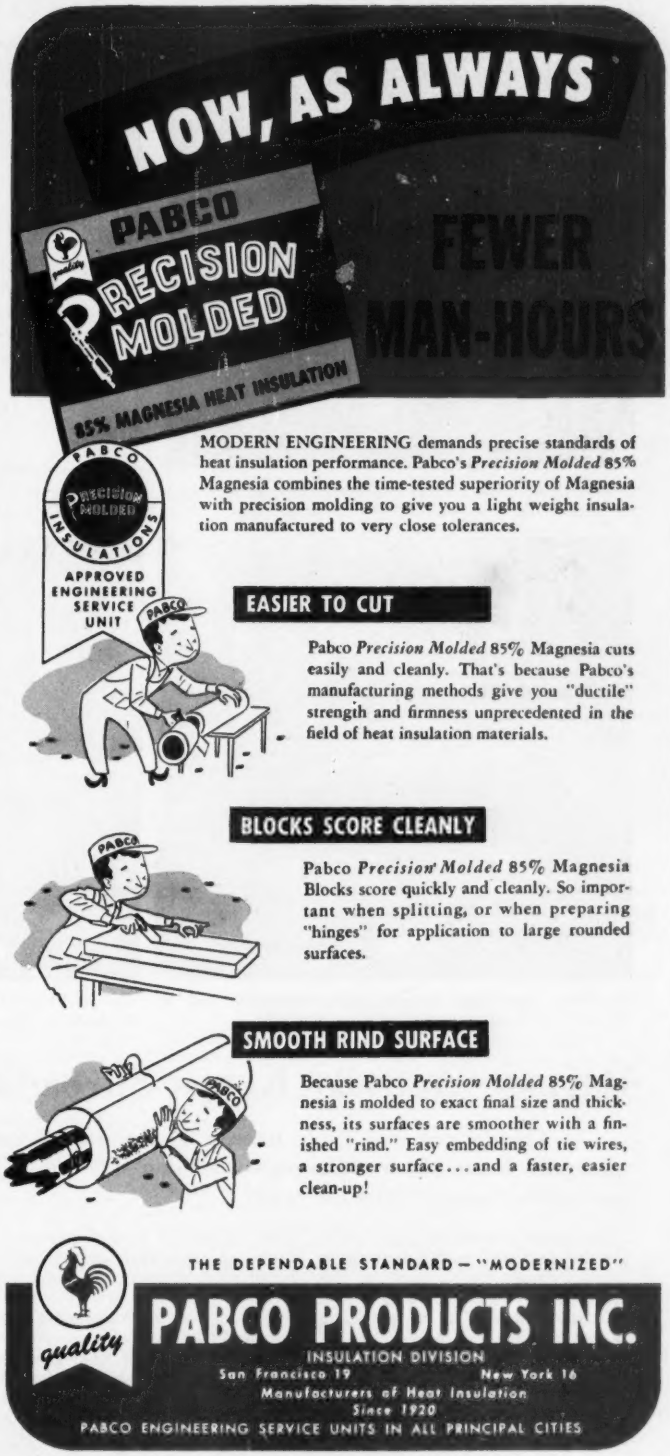
Fabrics and garments of 100 percent Acrilan or containing high percentages of Acrilan blended with other commercial fibers will reach the market this fall. Acrilan, made from natural gas and air, is the new acrylic fiber of Chemstrand Corp., jointly owned by American Viscose Corp. and Monsanto Chemical Co.

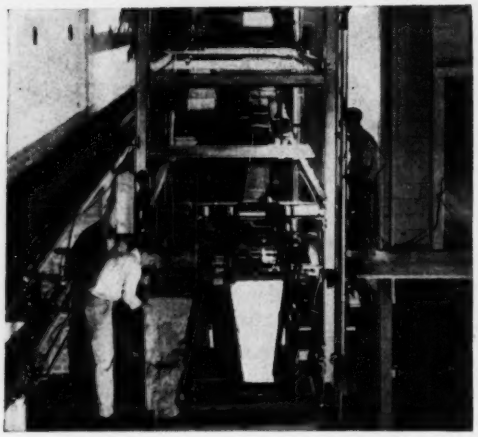
Acrilan will flow to textile mills at first in a trickle and then in a flood as Chemstrand's New Decatur, Ala., plant swings into production at an initial rated capacity of 30 million pounds of staple annually.

Production of intermediate raw materials has been started at the Decatur plant. A period of raw materials processing is necessary before actual fiber production gets under way.

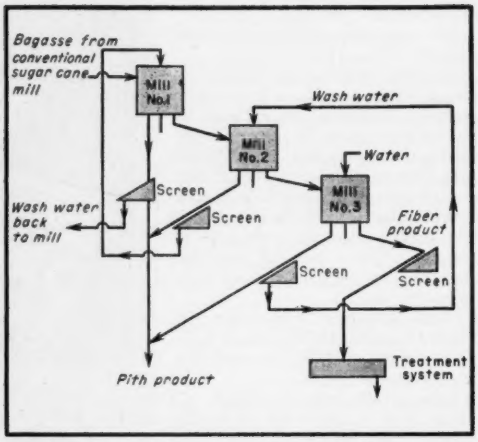
Chemstrand's pilot plant at Marcus Hook, Pa., has been producing fiber since November 1950. Fiber from Marcus Hook will be used in fabrics and garments coming on the market this fall. Output of the pilot plant will be supplemented at accelerated rate when fiber production starts at Decatur.

Meantime, Chemstrand is constructing near Pensacola, Fla., a second plant to manufacture 50 million pounds of nylon filament yarn per year. This plant is expected to be completed in 1953, with full output anticipated early in 1954.


NOW, AS ALWAYS
PABCO
PRECISION MOLDED
85% MAGNESIA HEAT INSULATION
FEWER MAN-HOURS
PABCO PRECISION MOLDED INSULATIONS
APPROVED ENGINEERING SERVICE UNIT
MODERN ENGINEERING demands precise standards of heat insulation performance. Pabco's Precision Molded 85% Magnesia combines the time-tested superiority of Magnesia with precision molding to give you a light weight insulation manufactured to very close tolerances.
EASIER TO CUT
Pabco Precision Molded 85% Magnesia cuts easily and cleanly. That's because Pabco's manufacturing methods give you "ductile" strength and firmness unprecedented in the field of heat insulation materials.
BLOCKS SCORE CLEANLY
Pabco Precision Molded 85% Magnesia Blocks score quickly and cleanly. So important when splitting, or when preparing "hinges" for application to large rounded surfaces.
SMOOTH RIND SURFACE
Because Pabco Precision Molded 85% Magnesia is molded to exact final size and thickness, its surfaces are smoother with a finished "rind." Easy embedding of tie wires, a stronger surface... and a faster, easier clean-up!
THE DEPENDABLE STANDARD — "MODERNIZED"
quality
PABCO PRODUCTS INC.
INSULATION DIVISION
San Francisco 19 New York 16
Manufacturers of Heat Insulation
Since 1920
PABCO ENGINEERING SERVICE UNITS IN ALL PRINCIPAL CITIES



IN LOUISIANA they're working to improve methods for separating bagasse fiber from pitch. They handle the problem . . .



. . . in their pilot plant process by using a modified hammer mill and water for separation.

IN PERU, bagasse-based wrapping paper is successfully made by W. R. Grace as are corrugated boxes and newsprint.

IN THE PHILIPPINES a commercial process sends bagasse pulp to sand traps, above, before it enters vibratory screens.

Bagasse Activity Keeps Spreading

There's new and lively interest in the use of the sugar cane byproduct to make paper, a Will-o'-the-wisp that has haunted industry men for years.

Uncertain supplies of paper products in many parts of the world have fanned interest and research in the use of sugar cane bagasse as a raw material. In the U. S. in particular, current high price of newsprint made from wood pulp has put a match to the situation.

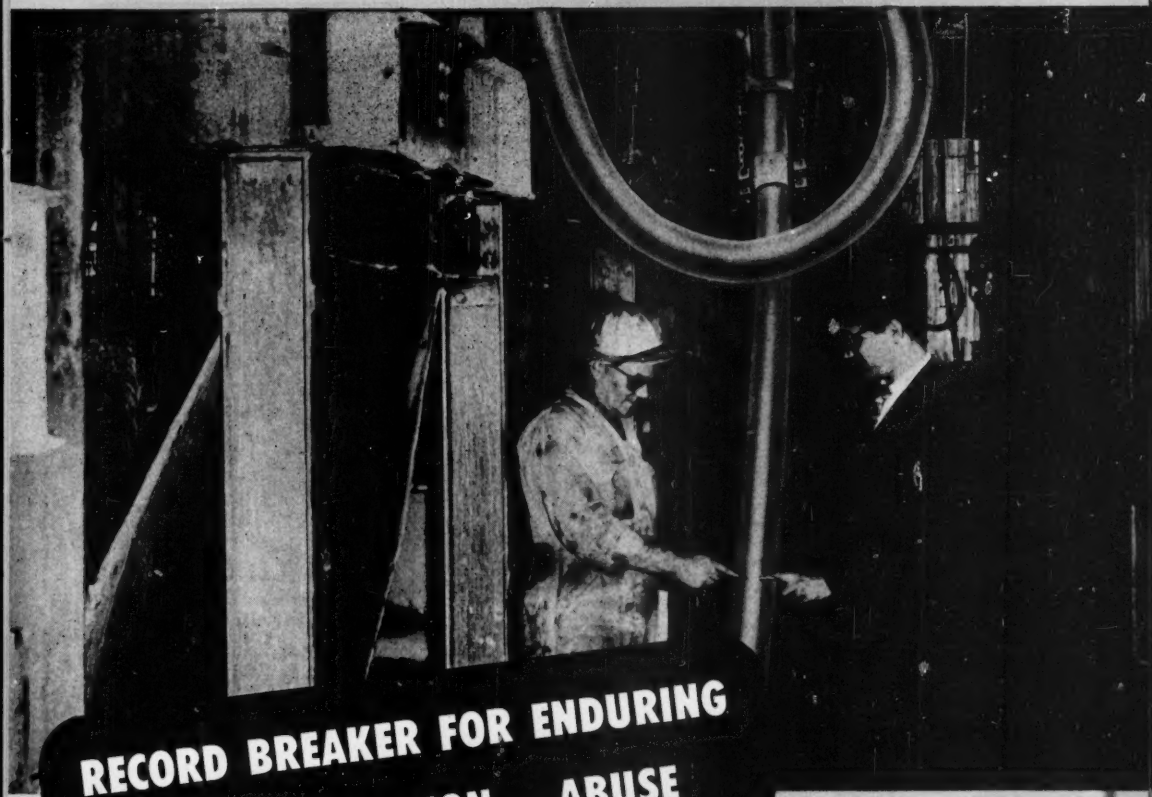
W. R. Grace & Co., one of the earliest and most successful entries in the paper-from-bagasse field, have been bombarded with inquiries. So many, in fact, that they staged a recent press conference to clear them all up at once.

The company's plant which is turning out 19,000 tons of paper product a year in Paramonga, Peru, gives the company unique qualification to speak. Its process has been thoroughly proven there by the acid test of commercial production.

► **Rash of New Developments**—But at many other sources, developments are being announced. In the Philippines, for example, a 4,500-ton-a-year plant of Compania General de Tabacos de Filipinas is approaching capacity production. They claim to be the first in the world to produce, on a commercial (though small) scale, fine writing and printing paper from bagasse by a completely continuous process.

They are employing the Celdecor-Pomilio soda-chlorine process—elemental chlorine is used as a delignifying agent following mild predigestion.

QUAKER *Production-eered** HOSE



RECORD BREAKER FOR ENDURING ACID . . . ABRASION . . . ABUSE

QUAKER ACID SUCTION HOSE

WITHSTANDS ROUGH "AROUND THE CLOCK" SERVICE WITHOUT BREAKDOWN

Moved five times every three and one-half hours . . . dragged over rough brick from one vat to another . . . transporting thousands of gallons of sulphuric acid—that's the 24 hour a day torture test to which Quaker Acid Suction Hose was put in a large chemical plant. Results proved it surpassed all previous records for rough service. Quaker Hose withstood the terrific punishment of abrasion, twisting, crushing, and acid.

Quaker acid suction hose is just one of many pretested, laboratory controlled products that are constantly proving their value to the chemical industry by boosting production and cutting costs. Every Quaker product is "production-eered" for top performance.

Quaker service . . . products . . . and research are yours to rely upon in improving your production efficiency. Let a Quaker representative analyze your problem and help you lower costs while you increase efficiency. Call your nearest Quaker Branch or drop a card to our main office, and we'll have a representative call.

"Production-eered"—Every Quaker Industrial Rubber Product is "production-eered"—engineered to provide maximum life, efficiency, and production on each type of installation. For timely production tips, get this new free booklet.

Free Booklet

QUAKER RUBBER CORPORATION

DIVISION OF H. K. PORTER COMPANY, INC.

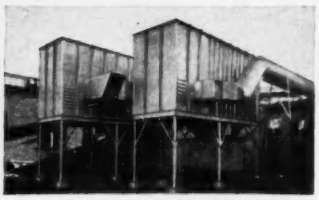
PHILADELPHIA 24, PA. • BRANCHES IN PRINCIPAL CITIES

This big Pangborn "CH" Collector, at Garden City Foundry, Stoughton, Wis., serves the foundry's grinding wheels and its Pangborn Blast Cleaning Machines. Result: Plant and equipment are protected from excess abrasive dusts, and employees work in a dust-free area!

GOT a DUST PROBLEM?

These Companies Had— and look what PANGBORN did for them!!

Here is the hood and piping system which conveys dust laden air to Pangborn Collectors at Middlesex Silver Co., Middletown, Conn. Valuable silver fines recovered with this system are worth $15,000 a year, after all operating costs of the system have been paid!



This one Pangborn installation solved six dust control problems for Kingsbury Machine Tool Co., Keene, N.H. Heating costs have been lowered substantially through recirculation of cleaned air, costly dust damage to machinery and products has been prevented, and workers' efficiency has increased!

THE THREE EXAMPLES you see here are actual case histories of dust problems solved by Pangborn Dust Control Equipment. In each case, Pangborn engineers studied the problem, recommended a solution, and worked closely with plant supervisory personnel in securing the greatest benefits possible from the dust control equipment.

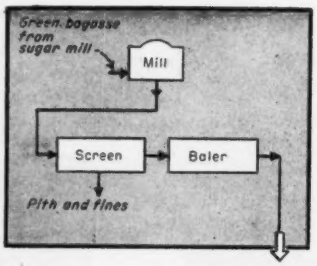
Not that these examples are unusual; they're typical of Pangborn's day-to-day operation. Improving working conditions, removing dust hazards, improving community relations, saving money through reclamation and salvage of the dust collected—these are Pangborn's stock-in-trade—these are the benefits literally thousands of plants are enjoying, thanks to Pangborn.

What are your Dust Problems? Find out what Pangborn can do to solve them. Write for Bulletin 909A. Address: PANGBORN CORP., 2600 Pangborn Blvd., Hagerstown, Md.

Look to Pangborn for the latest developments in Dust Control and Blast Cleaning equipment

Pangborn DUST CONTROL

STOPS THE DUST HOG from stealing profits



STORAGE of baked bagasse.

It is reported that plans for using the process in a new Brazilian plant are under discussion. It is already in use on a limited scale in Argentina, Colombia and Formosa, as well as in Brazil.

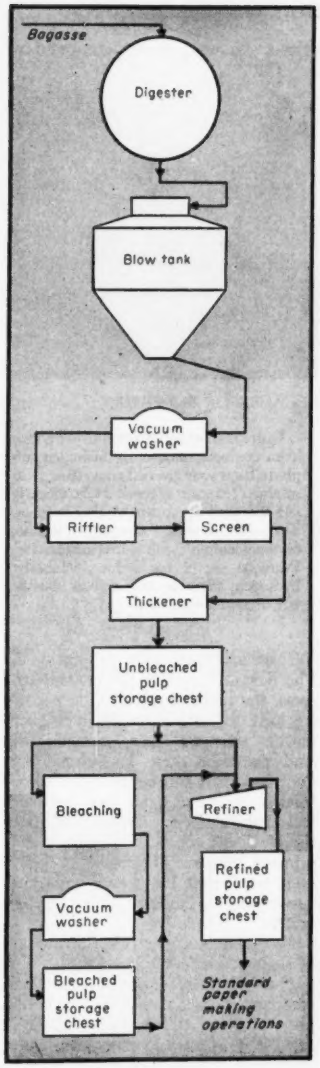
Valite Corp. of New Orleans has announced a new process by which newsprint can be produced from whole sugar cane bagasse. All the pith is contained in the paper and it is notable for total absence of clay filler. No plans have been reported as yet for manufacture of the paper.

A research project is underway at Louisiana State University. There, Prof. Arthur Keller and his associates, looking for a profitable outlet for the 750,000 tons of bagasse fiber produced in the state each season, have a new process in the pilot plant stage.

The Herty Foundation Laboratories in Georgia have announced a perfected prehydrolysis process for the production of a high quality newsprint from sugar cane waste on a commercial scale at low cost.

Some months ago Kinsley Chemical Co., Cleveland, stated that they were licensing their paper-from-bagasse process to a Brazilian firm which planned to build a $2-million, 50-ton-a-day plant.

▶ **Grace, the Elder Statesmen**—But the elder statesmen in the field are W. R. Grace & Co. In fact, they claim to be the only bagasse users to make a process work economically.



Despite present U. S. interest, Grace still feel that the near future for their process lies in countries like Mexico, Brazil, Egypt and Puerto Rico—all of which are short on pulp and long on bagasse waste. These are the countries whose local investors are now negotiating to license Grace's process. (Sandy Hill Iron & Brass Works, Hudson Falls, N. Y., makers of the machinery for Grace's Peruvian plant, are authorized to do the licensing.)

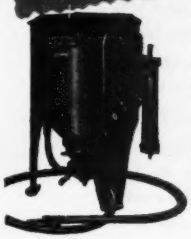
Bagasse products can compete both in quality and price in these countries. In fact, quality-wise, says the company, their Peruvian products ask no quarter in any market.

Here's how Pangborn

Solves these Problems

with this modern equipment

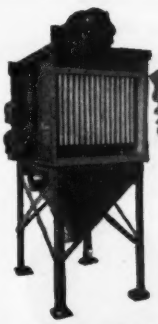
BLAST CLEANING!



Blast Cleaning Cabinet quickly and easily cleans rust, grime, dirt, paint, etc., from metal parts. Produces a clean, smooth surface on pieces up to 60" x 36". Models available from $319.00 and up.

Blast Cleaning Machine not only removes rust, dirt, scale, etc., but is ideal for maintenance and many other uses. Cleans large objects such as bridges, structural work, tanks before painting. Six sizes, portable or stationary, from $170.00 and up.

DUST COLLECTING!



Unit Dust Collector stops dust at its source, minimizes machine wear and tear, reduces housekeeping and general maintenance costs. Solves many grinding and polishing nuisances. Reduces material losses. Models from $286.00 and up.

PRECISION FINISHING!

Hydro-Finish Cabinet uses liquid blast, eliminating dust, and reduces costly hand polishing, cleaning and finishing of molds, dies, tools, etc. Removes scale, discoloration and directional grinding lines, prepares surfaces for plating and coating. Holds tolerances to .0001". Models from $1410.00 and up.

LOOK TO PANGBORN FOR THE LATEST DEVELOPMENTS IN BLAST CLEANING AND DUST CONTROL EQUIPMENT

Pangborn

MAIL COUPON for full details

(Check for more information)

- ☐ Blast Cleaning Cabinets
- ☐ Blast Cleaning Machines
- ☐ Unit Dust Collectors
- ☐ Hydro-Finish Cabinets

PANGBORN CORP., 2600 Pangborn Blvd., Hagerstown, Md.

Gentlemen: Please send me more information on the equipment I've checked at the left.

Name.....

Company.....

Address.....

City.....Zone.....State.....

63 years

of chemical engineering progress and achievement

In 1889, Dr. J. B. F. Herreshoff, under the sponsorship of Dr. William Henry Nichols, a charter member of the American Chemical Society, chemicals manufacturer and refiner of metals, developed the first circular, multiple hearth roasting furnace of American design and manufacture. This five hearth, 8' diameter furnace was used for the roasting of pyrite for the manufacture of sulphuric acid.

In all of the sixty years that have elapsed since the first furnace was constructed, the Nichols family has been closely connected with the development and manufacture of thermal processing equipment for the chemical and allied industries. Today, several thousand multiple hearth type furnaces bearing the names Nichols and Nichols-Herreshoff are in use throughout the world; some single units capable of processing up to five hundred tons of material in twenty-four hours.

In 1931 Charles Walter Nichols, son of Dr. William Henry Nichols, organized the Nichols Engineering & Research Corp. and became its chairman. Mr. Nichols and his son, C. W. Nichols, Jr., President, are devoting their leadership to the continuation of the design, development and construction of thermal processing equipment, proud of their association with the steady growth of the chemical industry.

Dr. William Henry Nichols (1852-1930)

Mr. Charles Walter Nichols Chairman

Mr. C. W. Nichols, Jr. President

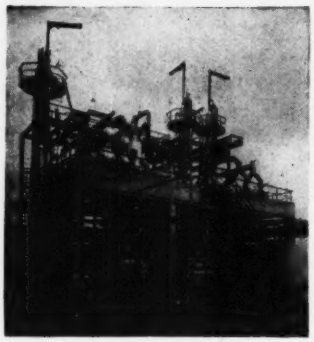
NICHOLS EQUIPMENT

Multiple Hearth Furnaces (Herreshoff and Wedge) • Nichols Freeman Vortrap* Classifiers • Nichols Freeman*, Flash Roasters • Nichols Tubular Coolers • Nichols Industrial Waste Incinerators • The Reener Screen • Sewage Sludge Dryers and Incinerators • Nerco Tower Dryers • Nerco-Niro* Spray Dryers • Nichols Bark Burning Furnaces • DWIGHT-LLOYD* Sintering Machinery • Pelletizer-Mixers • Transportometers* • Transportoweighers* • Transportofeeders*

* Reg. U.S. Pat. Off.

NICHOLS
Engineering & Research Corp.

70 Pine St., New York 5, N. Y.
1920 N. Meridian St., Indianapolis 2, Ind.
40 S. Los Robles Ave., Pasadena 1, Calif.
1477 Sherbrooke St., W., Montreal 25, Canada



BECAUSE OF SULPHUR

Current shortage of sulphur has petroleum engineers recovering hydrogen sulphide from sour gas and converting it to sulphur. Jefferson Chemical Co. recently put this unit on stream at Port Neches, Tex. It makes monoethanolamine, diethanolamine and triethanolamine. Principal use of the amines: scrubbing hydrogen sulphide and carbon dioxide out of sour gas.

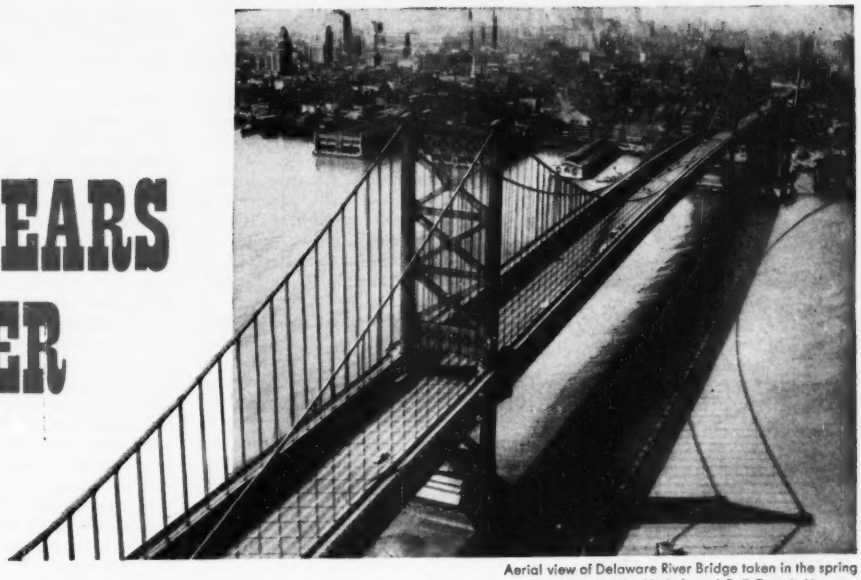
Take multiwall bags, for example. The bagasse products (45 percent bagasse, the remainder Kraft bag paper) are said to have a markedly higher tensile strength than competitors. And pricewise these bags from the Peruvian plant can compete on some foreign markets right now. Grace feel that the best economic bets for the U. S. market are book papers and printing papers. They do not, however, think that bagasse, now, is our answer to the Canadian price of newsprint.

Grace engineers explain the success of their process as follows:

▶ **Their Process, a Key Factor**—The company has delicately attuned its fiber treatment to bagasse so that they can get it to form and dewater freely enough to permit production speeds approximating 500 ft. of paper a min. These speeds vary from about 200 to 700 ft. a min. depending on the type of paper being produced. Sugar cane bagasse is made up of relatively short fibers that will not withstand much beating or refining without undue fiber cutting and excessive hydration. Processors less versed in the chemical and mechanical know-how for its down-the-line treatment have not been able to reach these economic speeds.

The process goes like this. From the sugar mill the bagasse comes to a mechanical defibrator, then goes through a mechanical screening step to remove the pithy material. Ac-

15 YEARS LATER



Aerial view of Delaware River Bridge taken in the spring of 1952, showing the High Speed Rail Transit Lines on outer sides of bridge. Photo by Aero Service Corporation.

...a report on the service of Everdur Electrical Conduit on the Delaware River Bridge

The Delaware River Bridge, linking Camden, N. J. with Philadelphia, opened to vehicular traffic in July 1926. In 1934-36, when the High Speed Rail Transit Line was installed, more than 200,000 pounds, or 14½ miles of Everdur* Conduit, in nominal sizes from 1½" to 4", was used for electrification and electro-pneumatic signal operations.

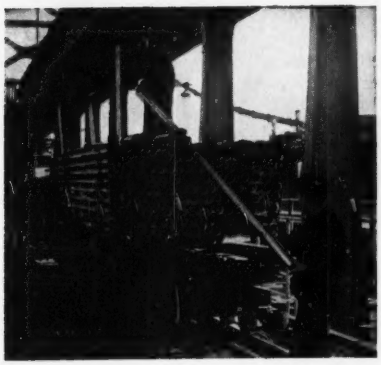
Service conditions were anything but good—and the problems encountered included corrosive industrial gases and almost continual vibration caused by the rapid transit rail cars and 70,000 motor vehicles a day.

Now, with another bridge expansion project planned, an engineer of The American Brass Company made an "on-location" inspection of the 15-year-old installation. The detailed report concludes as follows:

> *"It is my opinion that the corrosion rate of the unpainted Everdur Conduit installed on the Delaware River Bridge is very low, and that the conduit will last as long as the bridge itself."*

Everdur Electrical Conduit is made of Everdur Copper-Silicon Alloy in two wall thicknesses (R.C. and E.M.T.). Publication E-12 describes this ANACONDA Product in detail. For a copy, address The American Brass Company, General Offices, Waterbury 20, Connecticut. 52165

*Reg. U.S. Pat. Off.



In 1936, at the time of installation, the Transit Line rails were utilized to transport 20-foot lengths of Everdur Conduit to the cable runways.

wherever corrosion resistance counts ***consider***

EVERDUR ELECTRICAL CONDUIT

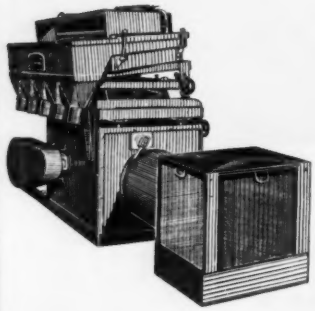
a product of

ANACONDA®

we can give you

98

good reasons why...



... it makes good sense to sit down and study out all the economic advantages of salvaging, classifying, and up-grading dry industrial products with Sutton Gravity Separators and Air-Float Stoners. Upon request, you will immediately receive a list of 98 different mineral and industrial products, each representing a distinct separating problem solved by *"effecting a difference in specific gravity through air-flotation."* Chances are S S & S Process answers your problem, too.

ADDRESS DEPT. "C"

SUTTON, STEELE & STEELE, INC.
1031 SOUTH HASKELL • DALLAS, TEXAS

SALES AND SERVICE: DALLAS • COLUMBUS, GA. • NEW YORK • PITTSBURGH • CHICAGO
MINNEAPOLIS • JACKSON, MICH. • DES MOINES • SAN FRANCISCO • TWIN FALLS, IDAHO
FOREIGN: WINNIPEG, CANADA • SAO PAULO, BRAZIL • LONDON, ENGLAND

SUTTON, STEELE & STEELE, INC.

cepted fibrous pulp is bailed for storage.

Next, a modified alkaline cooking process digests it in a pressure vessel. Variations in cooking time produce distinct paper types.

Pulp is blown out from the digester to a blow tank from which it is pumped to vacuum washers. It next proceeds through: rifflers which remove dirt; screens; thickeners which concentrate it to the right consistency for storage.

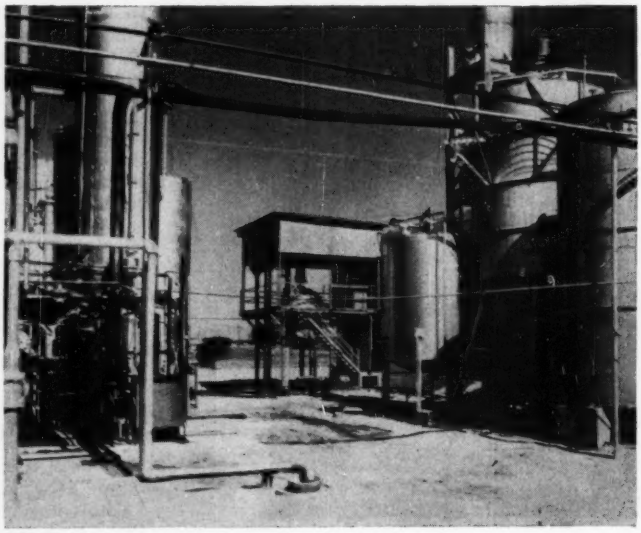
From the storage chest unbleached pulp goes to the refiner. At this point the pulp is ready for standard paper making operations or for bleaching.

▶ **Research Target**—Target of much of the research in the field seems to be better ways for separating the true fiber from the pith of the stalks, thereby increasing pulping characteristics. Most promising right now are, (1) a wet separation using a Hydropulper and (2) a separation using a modified hammer mill and water. The Hydropulper is being tried on a pilot-plant scale in Hawaii; the modified hammer mill process is in the pilot plant at Louisiana State University.

Both processes yield an excellent fiber with good pulping qualities. But success will depend on (1) cost of the operation; (2) satisfactory storage procedures for the clean separated fiber; and (3) development of a market for the separated pith (30-35 percent of bone-dry bagasse).

But many people question whether paper-from-bagasse will ever have widespread economic success in the U. S.—simply because we may not produce enough sugar to justify it. However, only 200,000 tons of the 750,000 tons of bagasse fiber produced in Louisiana are used profitably, and these for the production of wall board and agricultural mulch. The balance is burned as fuel by the sugar mills.

It's a possibility that the bagasse that's burned at the present time could be put to much better use for the production of pulp—at least in the areas close to production.



Dixie Gets New Resin Plant

Formaldehyde, synthetic resins and hexamethylenetetramine are now being produced in the new Demopolis, Ala., plant of Borden Co. First of its kind in the Southeast, the plant cost $1 million.

Initially, the plant will annually turn out about 20 million pounds of formaldehyde, 24 million pounds of synthetic resins, and 1.2 million pounds of hexamethylenetetramine, an intermediate used by the plastics and chemical industries. If required, production of "hexa" can be stepped up to 4 million pounds a year.

With minor adjustments, the plant can also turn out other chemicals. Raw materials for these can be

obtained from the coke ovens of Alabama's steel mills and from the petroleum fields of Texas and Louisiana.

The formaldehyde will be used principally by the Demopolis plant itself and its sister Borden plant at Kernersville, N. C., in the manufacture of synthetic resins. Resin products are used as adhesives and bonding agents by the plywood, furniture, paper and textile industries in the South, and as core binders by foundries in the area.

Production units at the new plant are all of outdoor construction, including the formaldehyde unit, a big reactor in which resins are made, storage tanks and towers. The plant occupies about one-third of the 20-acre site, leaving room for expansion.

The Demopolis site was picked because transportation facilities make possible quick, low-cost movement of raw materials and finished products. The plant is strategically located in the area of the South's most rapid industrial growth. The two principal raw materials, methanol and urea, are easy to get.

Methanol will be barged from the Texas Gulf Coast up the Tombigbee River to the Borden plant, which is along the river. Urea can be brought to the plant by rail and truck.

Elsewhere, Borden, which operates five other chemical plants in addition to the Demopolis and Kernersville units, has another new plant almost completed at Dominguez, Calif., for manufacture of resorcin.

CONVENTION CALENDAR

Fourth Western Packaging and Materials Handling Exposition, Los Angeles Shrine Convention Halls, Los Angeles, August 12-14.

Second Gordon Research Conference on Coal, New Hampton School, New Hampton, N. H., August 25-29.

National Agricultural Chemicals Association, annual meeting, Essex and Sussex Hotel, Spring Lake, N. J., September 3-5.

National Conference and Industrial Hydraulics, eighth annual conference, Sherman Hotel, Chicago, September 4.

National Chemical Exposition, Coliseum, Chicago, September 9-13.

National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, September 10-12.

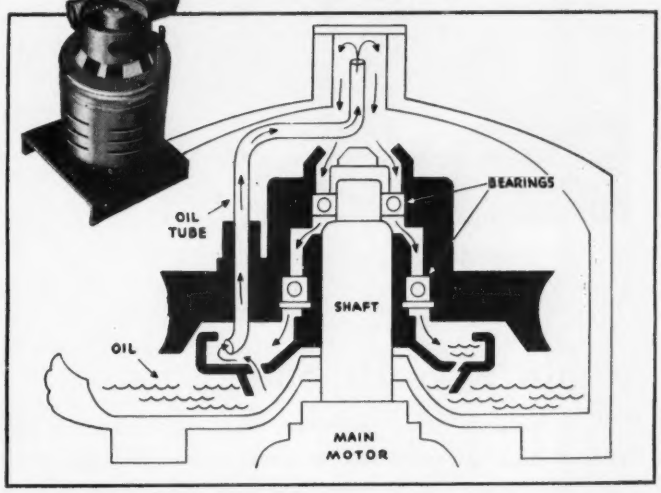
American Institute of Chemical Engineers, Palmer House, Chicago, September 11-13.

American Chemical Society, national meeting, Atlantic City, September 14-19.

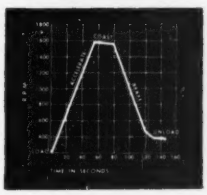
Drug, Chemical & Allied Trades Section, New York Board of Trade, annual meeting, Pocomo Mannor Inn, Pocomo Manor, Pa., September 25-28.

NOTHING LIKE IT!
NO PUMPS . . . NO VALVES

Simple, Positive Oiling System
In AT&M's Two-Motor Drive



Eliminating pumps and check valves, AT&M's built-in oiling system is simplicity itself. Oil in reservoir is scooped by the revolving baffle, then passes through port and up through tube, spilling out in sight glass at top. It then flows through bearings and back to reservoir. Another application of centrifugal force that assures positive, trouble-free performance!



AUTOMATIC PUSH-BUTTON TIMER CUTS COSTS, BOOSTS EFFICIENCY

AT&M's automatic cycle timers do away with clutches, high-cost, energy-wasting fluid drives. Timer holds centrifugal at loading speed until loaded, accelerates it to maximum, cuts off current for "coasting" period (see chart), then brings it to a quick, sure unloading speed. The loading is done with basket turning in same direction.

PROVE TO YOURSELF

how centrifuging can benefit you. Send us a sample of your material for centrifuging to your specifications, or rent an AT&M laboratory centrifugal for your own tests at a nominal fee. Send for free booklet.

FREE *Illustrated Booklet*

AMERICAN TOOL AND MACHINE COMPANY
1415 Hyde Park Avenue, Boston 36, Mass.

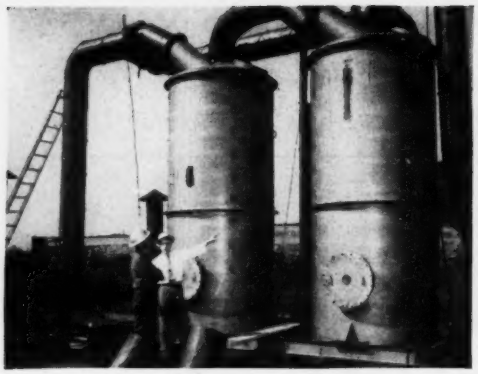
Please send me my free copy of the new AT&M booklet "Centrifugal Force." I am interested in the following processes:

Separation ☐ Extraction ☐ Dehydration ☐ Clarification ☐ Coating ☐ Filtration ☐
Draining ☐ Thickening ☐ Impregnation ☐ Sedimentation ☐

SAVE TIME, SPACE AND COSTS WITH

A.T. *and* M.
CENTRIFUGING

Name.....Title.....
Company.....
Street.....
City.....Zone.....State.....



SOHIO BUILT WHEN . . .

Soon to go into operation, this Fog Filter will take fatty acid odors and hydrogen sulphide out of fume at Sohio's Cleveland refinery.

Pollutant	SO_2
Concentration in	10,000 ppm.
Concentration out	0 ppm.
Temperature in	50° F.
Temperature in	40° F.
Scrubbing solution	Na_2CO_3
Concentration, by wt.	3%
Flow rate at 400 psi.	20 gpm.
Capacity of unit	850 cfm.

. . . RESULTS WERE GOOD

Experimental results obtained by Sohio engineers on a Fog Filter pilot plant model shows complete removal of sulphur dioxide.

Sohio Fogs Its Smog

To prevent air pollution, Standard Oil Co. of Ohio uses a high pressure fog to remove contaminants from refinery fumes. It has installed one unit, plans another.

As a result of recent air pollution investigations, civil, municipal and industrial groups–and everyone else in Cleveland–knew what caused the city smog. Chief offenders, studies showed, were sulphur dioxide, hydrogen sulphide and fatty acid odors pumped into city air by nearby refineries and grease manufacturing plants.

Standard Oil Co. of Ohio, with both refineries and grease plants under its charge, was one of the principal disturbers of municipal nostrils. Recently, Sohio, in cooperation with Cleveland's air pollution control program, took steps to clear its good name.

This spring, Sohio engineers, after some tedious development work, installed a new scrubber–for fatty acid odors and hydrogen sulphide–at its No. 2 refinery in Cleveland; it will go into operation shortly. They also plan to put in another scrubber to control sulphur dioxide and sulphuric acid mist in its plant for acid treatment of lube oil.

Both scrubbers, manufactured by R. C. Mahon Co., Detroit, Mich., will decontaminate plant fume in a swirling high pressure fog.* Called Fog Filters, they were developed principally to remove less-than-10-micron air contaminants. Other applications: Besides control of hydrogen sulphide, sulphur dioxide and fatty acid odors, they have been used on sulphuric acid mist, phosphoric acid, and phthalic and maleic anhydride.

▶**Pilot Plants & Pressure**–When Sohio engineers, under the direction of Supervisor E. P. Kropp, started preliminary pilot plant work, they turned to conventional low pressure spray towers. But the investigations shortly broke down. Chiefly responsible was sulphur dioxide, which refused to be taken out of fume samples.

Kropp soon discovered he was climbing the wrong tower. So he switched from low to high pressure spray towers, and real progress was made. Following its successful operation in other industrial applications, Kropp got ahold of a pilot-plant model (capacity: 850 cu. ft. per min.) of the Fog Filter.

After successful runs with sulphur dioxide (*see above*), Kropp, hoping for the same breaks, tried out the Fog Filter on the hydrogen sulphide fume. The first trial was made with water as a scrubbing medium, and flopped. A second trial with a 3 percent soda ash solution reduced the hydrogen sulphide concentration in an air stream of 1,000 cu. ft. per min. from 2,200 ppm. to 200 ppm. For high efficiency, an 8 percent caustic soda solution was tried. It completely removed hydrogen sulphide from air even with an inlet concentration of 45,200 ppm.

The Fog Filter was next tried on the fatty acid odors. Trials showed that water as a scrubbing medium completely absorbed all odors.

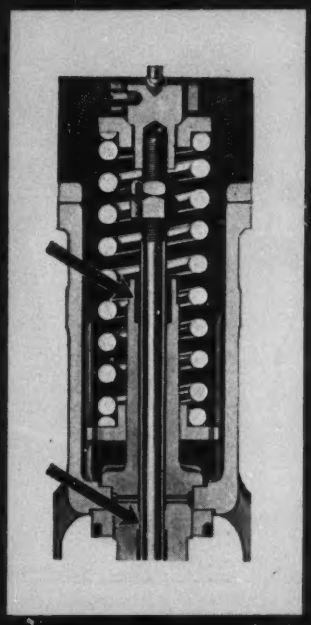
Meanwhile, Sohio officials had Manufacturer Mahon send the company a plant size unit (*see above*). Cost of the delivered scrubber was $6,900. This price does not include erection and installation of ductwork, blower and scrubbing liquid system, which includes pump, piping and caustic circulation tank. Altogether, cost of the installation came to some $60,000.

▶**How the Filter Works**–Fumes, sent close to the bottom of the first chamber by a central inlet tube, pass up the cylinder in a centrifugal motion (*see below*). The gases pass down the second chamber in a centrifugal motion and, finally, up and out through a central tube in the second chamber. An exhausting blower draws the gases through the equipment.

Scrubbing medium is introduced through a number of fog nozzles, which are placed around the periphery of the chamber. Because of their tilted position, the nozzles spin gases and suspended air contaminants at a high angular velocity. Centrifugal force throws the contaminants to the outer radial zone of the filter body. Here they are washed down to, and out through, the outlet drain to a settling and treatment pond or to a sewer.

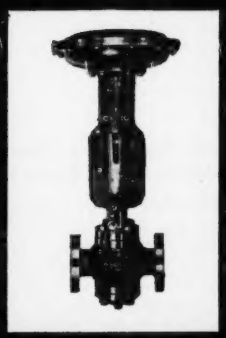
Why does the fog scrubber work? No one is quite sure. It may be gravitational attraction, random impact, surface potentials and electro-dynamics in addition to wetting and centrifuging. "The theory of operation is wide open for speculation by theoretical physical chemists," says Duncan G.

* To insure a high degree of atomization at the nozzles, a pump will probably maintain a pressure of 350-400 psi. Pressure drop across the unit itself is about 4.5 in. of water at rated capacity of 5,003 cu. ft. per min.



GUIDED STROKE...

for smoother stem movement



The two-point guiding of the upper stem in the Honeywell Series 700 Valve eliminates side thrust by supporting the stem at top and bottom in continuously lubricated bearings . . . assuring practically frictionless response to the slightest changes in signal air pressure. The Honeywell Series 700 wide band proportional valve comes in a full range of styles and sizes . . . has *all* the features you look for in a fine valve. Write today for your copy of Bulletin 700-2.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 1904 Windrim Avenue, Philadelphia 44, Pa.

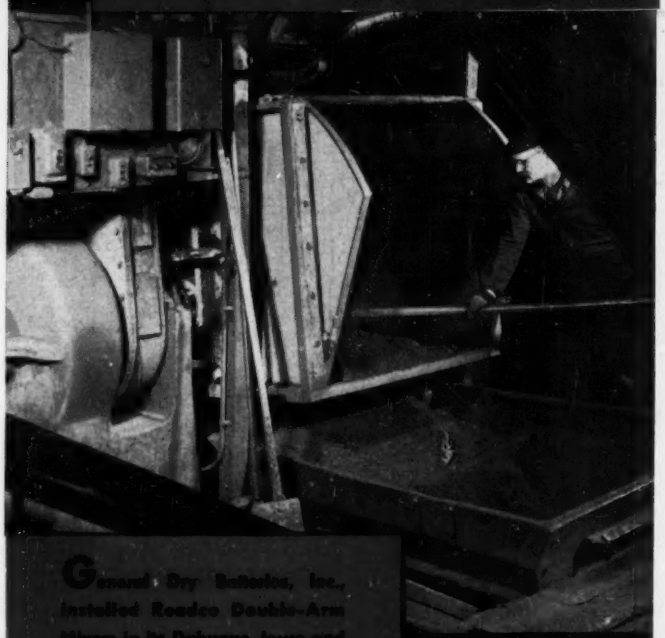
MINNEAPOLIS

Honeywell

VALVE PRODUCTS

First in Controls

OVER 10 YEARS AND 260 MILLION POUNDS AGO...

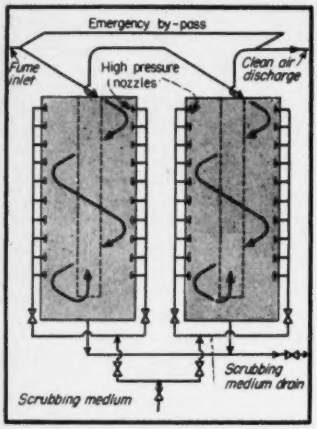


General Dry Batteries, Inc., installed Readco Double-Arm Mixers in its Dubuque, Iowa and Cleveland, Ohio Plants to mix depolarizer materials for its complete line of Radio, Flashlight, and Hearing Aid batteries. These mixers have been in continual use, handling capacity loads of this abrasive, highly corrosive compound without a breakdown.

Readco Mixers are designed to do a specific job. They do it well.

READ STANDARD CORPORATION

BAKERY-CHEMICAL DIVISION: YORK, PA.
LOS ANGELES 39, CALIF.



FOG FILTER FLOW SCHEME: ". . . swirling high pressure fog."

Hudson of Mahon Co., who developed the unit.

Major characteristic of the fog system is one of surface effect. Wetting agents have been used in the supply water but there has been no noticeable benefit from their use. ". . . it provides, in place of a solids-packed absorption tower, a fine liquid sphere-packed tower," says Hudson.

As a result, there is some air flow resistance, usually amounting to 2 to 4 in. water gage. To keep down air resistance and to increase the time element essential for efficiency, the filter units are fairly large.

There is some water lost as vapor, and it may be as high as 20 percent. But there is no mist emissions when units are properly designed. "Generally speaking, the use of high pressure fog will employ a third to one half the amount of water required in a conventional low pressure scrubbing tower," Hudson says.

Direct Reduction Process Produces Alloys From Clay

Intermediate alloys containing aluminum and silicon will be produced in a commercial pilot plant that Apex Smelting Co. will construct in the Pacific Northwest. Clay will be used as a raw material.

This is a further step in a development started five years ago when Apex first investigated direct reduction of clays containing these metals.

Through cooperation of the Tennessee Valley Authority and the Bureau of Mines, Apex was able to develop further details of this process. The alloys produced experimentally

have been tested by Apex and used successfully in products of other manufacturers.

Alloys produced by this direct reduction process will be used by Apex in its own products, and will also be available to other metal users. Production will be expanded as soon as optimum design is determined in pilot-plant operation.

Ferguson Will Build Oxygen Plants Using Elliott Process

Tonnage oxygen plants for industry will now be built by H. K. Ferguson Co. on a turn-key contract basis. In addition to oxygen, the plants will produce high-purity nitrogen. Ferguson envisions individual commercial installations to produce more than 1,000 tons of oxygen per day—over 25 million cubic feet.

All process and patent rights covering the Elliot oxygen system have been purchased by Ferguson. Dr. Irving Roberts, who helped to develop the Elliott system, has been retained by Ferguson as a technical consultant to firms planning to install the oxygen plants.

The Elliott process recovers more than 97 percent of the oxygen in the air charged to the system. Liquid nitrogen is readily available from the system; gaseous or liquid nitrogen is of 99.82 percent purity.

Ferguson engineers cite these other advantages of the Elliott process: (1) the system is mechanically simplified; (2) it operates efficiently even at reduced loads; (3) it's completely immune to acetylene explosions—a hazard in present processes; (4) automatically controlled, it will adjust automatically to any oxygen demand; (5) it requires no periodic shutdowns for removal of water and carbon dioxide — important where processes must be kept on stream at all times.

Tonnage oxygen is becoming an important tool for the steel, chemical and process industries. Use of oxygen is expected to increase the output of open-hearth furnaces, blast furnaces, Bessemer converters and electric furnaces.

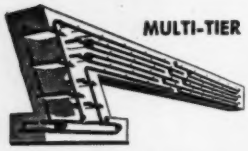
Tonnage oxygen is used in the production of gasoline, fuel oil and chemicals from natural gas or coal. It's also used in underground coal gasification. Other possible uses: smelting of sulphur-bearing ores such as nickel, copper, zinc and lead. And the use of oxygen in the chemical industry is constantly increasing.

The Elliott oxygen system results from work done by the Elliott Co. during the last war for the National Defense Research Council. Elliott's principal contribution was a success-

when the HEAT'S on...
for increased production involving heat transfer, the Readco Double-Arm Jacketed Mixer offers definite advantages.
Its unique bowl design provides a greater ratio of heated surface to the volume of mix. Close clearances between the mixer arms and shell eliminate build-up of materials, permitting increased heat transfer efficiency.
Overlapping sigma arm mixing action exposes new surfaces and breaks down the entire mass with each rotation, producing a homogeneous mix in a short mixing cycle and eliminating peak loads.
The flush-plug discharge gate prevents accumulation of dead volume. It can be supplied for manual, hydraulic or pneumatic operation.
Bakery-Chemical Division:
YORK, PENNSYLVANIA
LOS ANGELES 39, CALIFORNIA
READ STANDARD

CONTINUOUS PRODUCTION EQUIPMENT

for Bakery, Confectionery, Food, Chemical and Allied Industries



MULTI-TIER

Greer engineers are prepared to work with you on plant layout and to design special applications of the Greer Multi-Tier Conveyor for your particular product. Our wide experience with installations of this machine in many different industries can be invaluable in helping to convert from batch methods to continuous processing or to further simplify and streamline your present production processes. The Multi-Tier is the real answer to compact production and space-saving economy.

COOLING TUNNEL

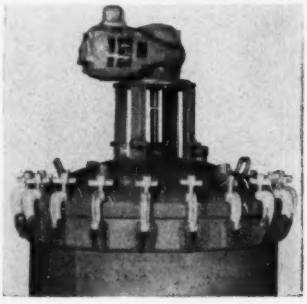
As an alternate to the Multi-Tier where shorter production periods are required, the Greer Cooling Tunnel offers the most efficient answer where controlled temperatures and air circulation are a factor. Thirty years of developing and building such equipment makes these units available in widths ranging from 16" to 52" and lengths variable by 8'. The special sectional steel belt offers a feature which provides the most efficient cooling obtainable.

GREER J. W. GREER COMPANY

119 WINDSOR STREET, CAMBRIDGE 39, MASS.

WHEN YOU THINK OF durable, non-corrosive STAINLESS STEEL TANKS

mixing • storage • jacketed pressure • and vacuum



THINK OF The ERB MANUFACTURING COMPANY

Specialists in Mixing Tanks . . . fabricated to your specifications or designed by our engineers. STEEL or STAINLESS STEEL. Sizes: 30 to 5000 gallons

For single unit to complete plants send us your specifications. Consult our Engineering Department without obligation.

— *Since 1903* —

Foremost Designers, Engineers and Fabricators of

STAINLESS STEEL PROCESSING EQUIPMENT

NOTE: A typical Erb installation of U. S. S. Stainless Steel on pages 50-51.

The ERB MANUFACTURING COMPANY Since 1903 707 S. BLUE ISLAND CHICAGO 7, ILLINOIS

ful design for the first low-temperature turbo-expander produced in the United States.

When the wartime project was completed, Elliott embarked on a three-year development program of its own that culminated in the design and construction of a pilot plant where a completely integrated oxygen system, with equipment of special design, was operated. This process has now been acquired by Ferguson, which will design and build complete oxygen plants in the U. S. and abroad.

New Electric Furnaces Swell Output of Vital Ferrosilicon

First electric furnace at the still unfinished $8 million ferrosilicon plant of Vanadium Corp. of America near New Haven, W. Va., is now operating. Four more furnaces will soon go into operation.

The plant will produce vitally needed ferrosilicon for the nation's steel industry. Ferrosilicon is used as a deoxidizing agent in practically all steel made.

Among the largest and most efficient in the alloy-producing industry, the new furnaces will require 50,000 kw. for over-all capacity operation.

Phenol, Cresol and Cymene Alcohols by New Process

Hercules Powder Co. will build an $8 million plant near Gibbstown, N. J., to produce hydrocarbon chemicals by a new process.

The plant will produce phenol, para-cresol, acetone and cymene alcohols. It will use a process developed by Hercules at its experiment station near Wilmington, Del. The new departure in phenol manufacture centers on production of organic hydroperoxides as the basic intermediate step in converting hydrocarbons into phenols and cresols.

The new Hercules method does not consume sulphur or chlorine, basic raw materials now critically scarce and ordinarily consumed in other processes used up to now.

A site on the Delaware River, slightly northwest of Gibbstown, between the plant of Socony-Vacuum Oil Co. and the Repauno plant of E. I. du Pont de Nemours & Co., was picked. Propylene and benzene, both needed in the phenol manufacturing process, are available from petroleum refineries and coke ovens in the area.

Terpenes, the raw materials for the

NOW STANDARDIZED

3 Precision Controls for All Speed Problems

Here's governor standardization that "pays off". Nowyou can economically solve all speed-control problems with only three basic governors.

Costly special engineering is eliminated. Advanced design gives an unusual degree of flexibility... with precise speed control for all steam conditions. Results? Initial costs are lower... shipments are quicker... spare-parts inventory is reduced.

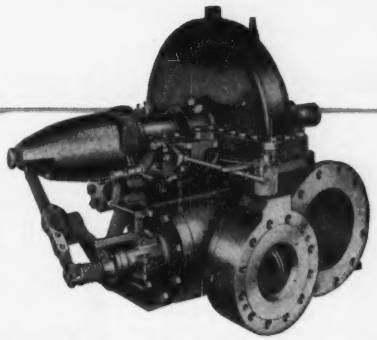
Designs for three basic classes of steam conditions, three wheel sizes, and three types of governors provide, in effect, twenty-seven standard variations to cover a wide range of applications. All oil-governed, direct-connected Type E units include the standard reservoir-type base, as illustrated. What's more, Type E governors can meet a great number of special requirements with optional accessories. This standardization results directly from Westinghouse's wide experience in all industry.

Other outstanding maintenance-saving features on the Type E turbine are Dual Protection... Weather Protection... Centerline Support... and a Rugged Governor Housing. Ratings are available from 5 to 1,500 hp.

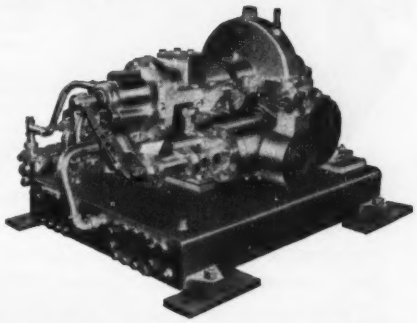
For complete information ask your nearby Westinghouse representative for Type E Turbine Book B-3896, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

YOU CAN BE SURE.. IF IT'S Westinghouse

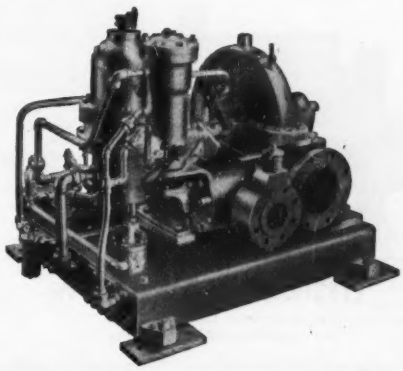
TYPE E Turbines



Shaft-Type Governor. For narrow speed-range applications, this governor automatically positions the steam admission valve to control turbine speed within close limits—*6 to 8% speed regulation.*



Hydraulic-Orifice Governor. For wide speed-range applications such as drives for fans, blowers, and compressors —*3-to-1 speed-adjustment range; 6% speed regulation.*

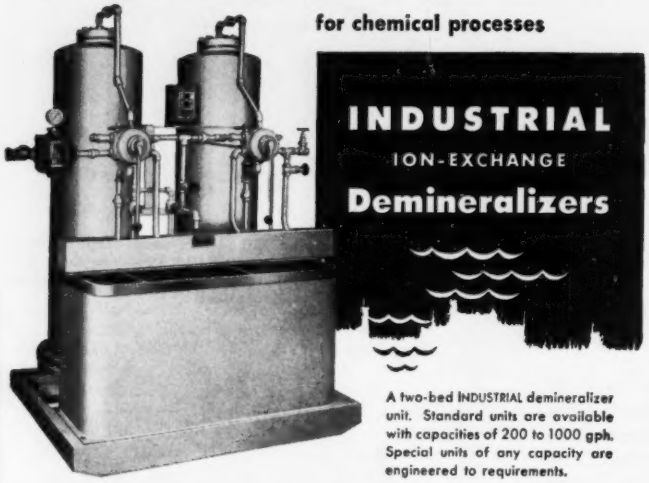


Vertical Oil-Relay Governor. For narrow-range precision-control applications such as drives for generators, pumps, blowers and compressors—*33⅓% speed-adjustment range; 4% speed regulation.*

J-50527

PURE WATER *at Low Cost*

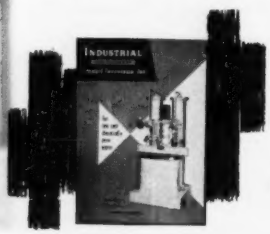
for chemical processes



A two-bed INDUSTRIAL demineralizer unit. Standard units are available with capacities of 200 to 1000 gph. Special units of any capacity are engineered to requirements.

Since chemically pure water costs so little with an INDUSTRIAL demineralizer, there is no reason for not having the benefits of demineralized water. It simplifies product-quality control in so many processing operations.

The equipment required is very simple—no heat, steam, or cooling water is used. Units can be made to deliver almost any quantity of purified water. The operation is practically automatic—requiring only limited attention periodically.



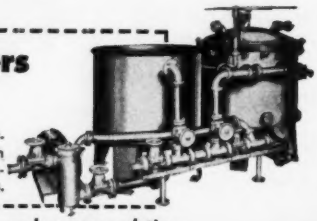
Ask for Bulletin 200

This bulletin gives the details on INDUSTRIAL demineralizers with specifications and performance data on the standard models. If you want information on a particular problem, send us a water analysis, degree of purity required, amount in gallons per hour, and whether the flow is to be continuous.

INDUSTRIAL Filters

For Solution Clarification
Any Solution—Any Quantity

A typical INDUSTRIAL stationary filter. Standard portable and stationary models are available with capacities 100 to 15,000 gph. Special filtering systems are engineered to meet unusual requirements.



Write for full information and recommendations

FILTERS Pressure Type · PUMPS Centrifugal · CORROSION TESTING APPARATUS Salt Fog • Humidity

INDUSTRIAL FILTER & PUMP MFG. CO.

RUBBER DIVISION Vulcanized Linings • Molded Products · WATER DEMINERALIZERS

5918 Ogden Avenue
Chicago 50, Illinois

new para-cresol process, will come from Hercules plants in Georgia and Mississippi.

Although located on the river front, the plant will not, at least for the present, receive raw materials by water transport. Raw materials will reach the plant by rail, truck or pipeline.

The plant will occupy only 60 acres of the 275-acre site, leaving room for future expansion. At the outset, the plant will employ 70 to 80.

Construction will start late this year or early next year, depending upon the availability of building materials. Among the first things installed will be a railroad spur, sewage facilities and water lines.

Phenol and para-cresol go into resins, disinfectants, dyes and pharmaceuticals. Acetone, of course, is an important industrial solvent and chemical intermediate, while cymene alcohols are marketed by Hercules as flotation and wetting agents.

Improved Grinding Method Speeds Paint Making

Paint plants can increase production or cut manufacturing time without decreasing quality of most paints by using an improved processing method developed by chemists of Goodyear Tire & Rubber Co.

A new concept, applicable to most paints manufactured in pebble or ball mills, has been introduced by J. J. F. O'Neill and Robert Fremgen of Goodyear's Akron laboratory. They determined and used for the first time the most favorable paste compositions, pebble loadings and paste loadings in the manufacture of Pliolite S-5 paints.

In either pebble or ball mills, the proportion of grinding matter—pebbles or balls—to the amount of paint components may vary widely. By their research, O'Neill and Fremgen found out what quantities of grinding matter may be employed most effectively with various quantities of paint components.

Employing these most favorable conditions with four different types of Pliolite S-5 paints, O'Neill and Fremgen got higher output per mill, improved grinds or shorter grinding times, greater uniformity of finished product, more brilliant colors and more complete color or tone development.

A high styrene-butadiene synthetic resin, Pliolite S-5 is produced by Goodyear's Chemical Division. It is used in exterior stucco, concrete and masonry paints, concrete floor enamels, plaster

sealers, chemical-resistant finishes and similar type coatings.

Using a method devised by Frederick K. Daniels, O'Neill and Fremgen first determined the optimum paste compositions, or the combination of Pliolite, pigment and solvent in which pigment clusters can be most effectively dispersed.

With this information they then ascertained the most effective pebble mill loading of both pebbles and paste by further experimentation, measuring the time required to achieve specific fineness of pigment grind.

PVC Resin Price Adjustment Permitted by OPS Action

The Office of Price Stabilization has acted to restore the customary price uniformity among producers of polyvinyl chloride resins by permitting any producer whose GCPR ceiling price is less than 38 c. per lb. to come up to this price.

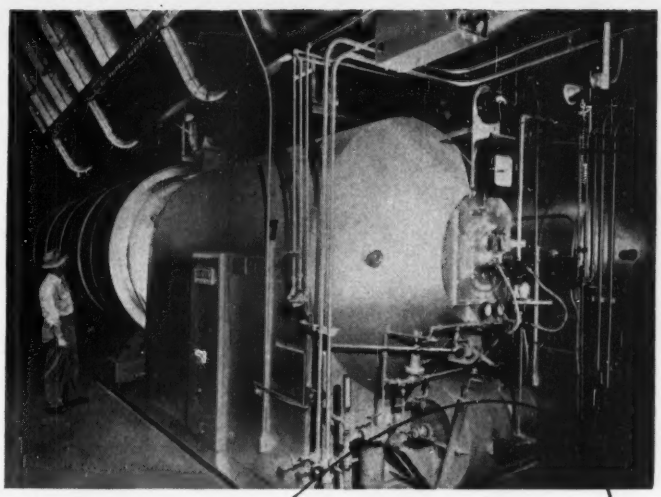
OPS explains that its action amounts to an adjustment to bring into line the price of the one producer who failed to take the 2 c. per lb. increase put into effect by the rest of the industry early in December 1950. At that time, this producer was operating on an experimental basis, but is now in regular production.

Polyvinyl chloride resins are used to make such plastic products as tablecloths, shower curtains, wire insulation, raincoats, shoes, phonograph records, food containers and upholstery materials. In 1950, the industry produced 315 million pounds of polyvinyl chloride resins valued at $117 million. The present price of 38 c. per lb. is less than the price prevailing from 1942 to 1944.

Plasticizer Production Hits Record 280 Million Pounds

Production of plasticizers in 1951 reached 280 million pounds—highest on record. This was an increase of 15 percent over production in 1950, the previous record. In 1951, according to the U. S. Tariff Commission, 210 million pounds of plasticizers, valued at $84 million, were sold. This compares with 187 million pounds, valued at $65 million, in the previous year.

Production of cyclic plasticizers in 1951 was 204 million pounds, compared with 181 million pounds in 1950. Sales in 1951 were 152 million pounds, valued at $57 million, compared with 137 million pounds, worth $46 million in 1950. This was



Up goes quality,
Down go costs

LET Cyclo-Matic Drying help you

Successfully process chemical and drug residues, sludges, sages, and leafy plants

. . . yours only in

ARDRIER DRYERS

With Cyclo-Matic Drying, it costs less to get highest quality output—relatively cool, due to rapid moisture evaporation, short retention time in drum. Outlet temperature and moisture content are thermostatically controlled. No boiler is required — heat exchanger losses are eliminated.

Ardrier Dryers save you money on original cost — on installation, operating and maintenance costs, also. Capacities 2,000 — 12,000 lbs. of water evaporated per hour.

Find out more about how Ardrier's exclusive 3-pass drum and showering flight design can lower your per-ton drying costs. Send coupon for bulletin.

Ardrier Dryers are manufactured by The Heil Co.

Arnold Dryers are successfully processing:

Chemical, drug, and antibiotic residues.

•

Various sludges from vacuum filters.

•

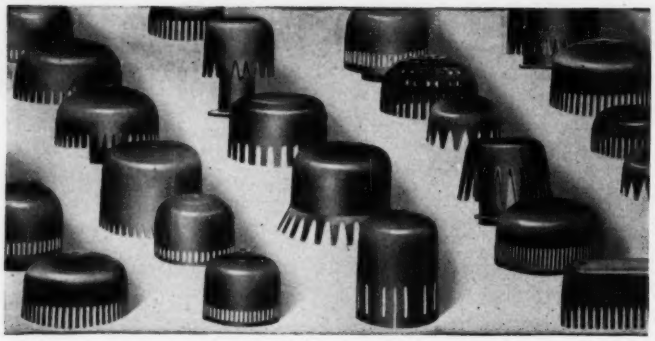
Various sages and leafy plants, prior to final extraction, etc.

TEAR OUT COUPON AND MAIL TODAY!

ARNOLD DRYER COMPANY, Dept. 8742
3087 W. Montana Street, Milwaukee 1, Wis.
Send me Ardrier Dryer bulletins.

Name.....Position.....
Company.....
Company Address.....
City.....(.....) State.....

ADC-8



SEND FOR PSC

BUBBLE CAP BULLETIN 21

Largest Compilation of Engineering Data.

Lists 200 Styles Furnished Without Die Cost.

This standard reference contains complete specification information for over 200 standard styles of bubble caps and risers. Also drawings for use in determining methods of tray assembly. All styles listed in Bulletin 21 are furnished promptly, without die cost, and in any alloy to meet your coking or corrosion problems. Special caps gladly designed; write as to your needs.

THE PRESSED STEEL CO., 707 N. Penna. Ave., Wilkes-Barre, Pa.

PSC

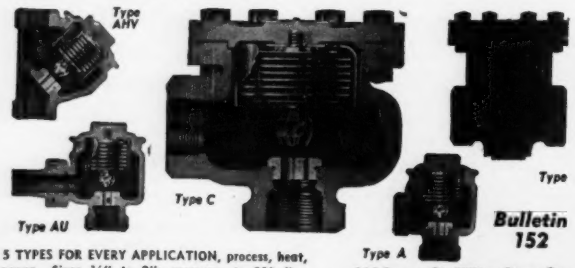
Custom Fabricators for the Process Industries Since 1928. Send Your Blue Prints

In This Plant Nicholson Traps

SAVED 10% IN STEAM COSTS

Chief Engineer H.F.D. stated, after Nicholsons replaced mechanical traps in his plant: "Saving in steam waste cut our fuel cost at least 10%. Yet application temperatures were up 30°-40°. And relief of all air binding effected faster warm-up."

Operate on lowest temperature differential; 2 to 6 times average drainage capacity; maximum air venting. For other advanced Nicholson features send for Bulletin 152.



5 TYPES FOR EVERY APPLICATION, process, heat, power. Sizes ¼" to 2"; pressures to 250 lbs.

206 Oregon St., Wilkes-Barre, Pa.

W. H. NICHOLSON & CO.

TRAPS · VALVES · FLOATS

an increase of 11 percent in quantity and 24 percent in value.

The plasticizer produced in greatest volume in 1951 was di-2-ethyl hexyl phthalate, of which 65 million pounds was turned out.

In 1951, 77 million pounds of acyclic plasticizers were produced, an increase of 22 percent over 1950. Sales in 1951 were 58 million pounds, valued at $27 million, compared with 50 million pounds, worth $19 million, in 1950.

West Virginia Pulp to Halt Calcium Carbonate Out-put

West Virginia Pulp & Paper Co. will discontinue manufacture of precipitated calcium carbonate on October 31. Most of West Virginia's production, which began in 1912, has been USP grade.

Shift in demand toward technical grades prompted the decision to discontinue the product. It's much more difficult to produce technical grades at competitive price levels because of constantly rising manufacturing costs.

West Virginia will intensify development of lignin. The company's Charleston, S. C., plant alone can produce about 400 tons per day.

Sodium Sulphate: Bureau of Mines estimates deposits of hydrous sodium sulphate (Glauber salt) at 30,439,000 tons in North Dakota and eastern Montana lakes. Of the total, 23,849,000 tons is in permanent beds; 421,000 tons in brines; 2,450,500 tons occurs as intermittent crystals; and the remaining 3,718,000 tons in crusts and muds. Private investors are interested in a sodium sulphate industry in North Dakota.

DDT Output: There will be enough sulphuric acid for DDT production, and the industry will produce about 150 million pounds of DDT during 1952-53. June production was expected to be 12 million pounds, and present inventory should be high enough to meet any threat by insects to agricultural production.

Sulphur Recovery: Alberta's first plant for extracting sulphur from natural gas has just been started up by Shell Oil Co. of Canada, Ltd., at Jumping Pond, 20 mi. west of Calgary. Getting natural gas from six neighboring wells, each rated at 10,000 cu. ft., the $500,000 extraction plant will annually recover 10,000 long tons of sulphur.—*End*

Now LUBRICATE the PORTER WAY

with Grease Fittings and Gun

Save time — Save lubricant, with PORTER Lubricated PLUG VALVES fitted with button head grease fittings.

For quick, convenient and positive lubrication of the valve, PORTER Lubricated PLUG VALVES, in sizes from 6 inches to 24 inches, have Button Head Type Grease Fittings as standard equipment.

Smaller sizes are equipped for lubrication with stick type Porterlube. These sizes will be equipped with Button Head fittings at no additional cost when ordered.

The operating life of any lubricated plug valve is largely dependent on the quality of the lubricant and the frequency of its use, so PORTER has made it easy and economical to service PORTER lubricated PLUG VALVES.

When ordering PORTER VALVES, be sure to order PORTERLUBE for guns, in drums, 5 gallon cans, or gun size sticks; also Porter Lubricating Gun, 12" hose extension and adjustable Carrying Strap.

PORTER Lubricated PLUG VALVES are easy to install, easy to open and close, provide positive control, require less maintenance and stay in operation longer.

PORTER

H. K. PORTER COMPANY, INC.
VALVE DIVISION
DRAWER 2650 TULSA 1, OKLAHOMA

Readers' Views & Comments

"In the synthesis of liquid fuels . . . high-Btu. gas must be a co-product."—H. H. Storch.

Coal: Gas, Fuel, Chemicals

Sir:

Here is my answer to your question on the problems of the gas and fuel industry.

Cost of the manufacture of water-gas (hydrogen-carbon monoxide mixture) from coal is a large fraction of the total cost of converting coal to high-Btu. gas or to liquid fuel.

A possible process which would greatly reduce the price of water-gas is underground gasification of coal. Although some encouraging results have been obtained recently in full scale tests at Gorgas, Ala., many difficult engineering problems remain to be solved before water-gas of constant composition can be produced.

Indeed, it may not be feasible to manufacture water-gas suitable for synthetic purposes by this process. The next cheapest alternate involves development of a very cheap coal mining procedure, and of a process for complete gasification of coal. Despite the relatively high degree of mechanization recently achieved in some coal mines, the use of sonic vibrations or hydraulic forces for disintegration of coal seams should be investigated.

Development work on the gasification of coal for synthesis-gas production has been in progress for many years in Germany and for the past five years in the United States. The use of oxygen for the gasification of coal makes possible operation at 30 atmospheres pressure, thus avoiding the compression of the synthesis gas for synthetic liquid fuel production. Only one fully engineered process of this type (that of Lurgi in Germany) is available. As this process requires a non-coking, carefully-sized coal feed, the desirability of a procedure using powdered coal entrained in a steam-oxygen mixture is apparent. Such a process should be applicable to coking coals.

An alternative gasification process should be developed to use partial combustion of the powdered coal with air at atmospheric pressure to supply heat for the subsequent endothermic steam-carbon reaction. The cost of compressing the synthesis gas is offset by the use of air rather than oxygen. The use of expanded and fluidized beds of powdered coal for such a process now is being studied in Great Britain, Germany and the United States.

Development of a sulphur-resistant methanation catalyst and its use in a fluidized bed is essential for the synthesis of high-Btu. gas from water-gas. When the wholesale selling price of natural gas at the Atlantic seaboard reaches about 60 c. per 1,000,000 Btu., it probably will be profitable to gasify coal in the Appalachian coal fields and convert the synthesis gas to methane for introduction into pipelines.

In the synthesis of liquid fuels it appears probable that high-Btu. gas must be a co-product. Thus an appreciable fraction of the coal in all known synthetic liquid fuel processes appears as methane and ethane. The design of large integrated plants which would supply all the demands of a given region for high-Btu. gas, liquid fuels, and organic chemical intermediates appears to offer the most economically feasible plan.

What about electric power production from coal? Here the use of fluidized carbonization, preferably in an atmosphere of hydrogen at about 500 psi. to produce a major proportion of char along with high-Btu. gas and an aromatic liquid fuel, offers considerable promise. Such char may be available to the power plant at a lower cost per unit of heating value than that of the coal from which it was produced—if adequate markets exist for the high-Btu. gas and the aromatic oil.

For steel manufacture the use of gas-reduction of iron ore in a vortex type of reactor should be studied. Powdered slagging materials should be mixed with the powdered ore and the temperature of the vortex maintained high enough to produce molten iron and slag at its tip.

H. H. Storch
Chief, Fuels-Technology Div.
U. S. Bureau of Mines
Bruceton, Pa.

". . . next a water-soluble product that forms an insoluble film?"—R. H. Kienle.

Look Ahead With Resins

Sir:

You asked me, "What are the most outstanding problems in the resins and plastics industry that can have most influence on its future progress?" Well, here they are as I see them now:

Emulsions of polymers and resins present a problem that is now being actively investigated. Already emulsion paints are appearing on the market. The attainment of improved stability and adhesion to all kinds of surfaces is a challenging problem.

But is the next step a water-soluble product which, upon drying, forms an insoluble film? The solution to this problem could well be a future advancement.

The fundamental principles of polymer formation appear to be fairly well understood. However, a challenging problem to the organic chemist is to apply these principles to the many new compounds that are being synthesized. This should provide new and improved products.

Because the Cameron Lift-Plug Valve effects a pressure-tight seal without the aid of lubricant, it is particularly desirable in services where the line product may have an affinity for valve lubricant, and where contamination of the product is undesirable. Tetraethyl lead is a case in point.

Also, many operators have switched to Cameron Non-Lubricated Lift-Plug Valves in order to prevent fouling the orifice plates in metering equipment.

The Cameron Valve is revolutionary in design. It has established new performance records in such services as: Corrosive chemicals, high working pressures, vacuum, and elevated temperatures. Try a few of these valves at the problem points in your plant for first-hand performance data.

Cameron

NON-LUBRICATED

LIFT-PLUG VALVE

Cameron

IRON WORKS, INC.

P. O. BOX 1212 • HOUSTON, TEXAS

Export Office: 74 Trinity Place, New York, N. Y. • Sterling Area: British Oil Field Equipment Co., Ltd., Duke's Court, St. James's, London S.W.1. England. • California: Cameron Iron Works of California, Box 267, Long Beach • Canada: Cameron Iron Works of Canada, Ltd., 9860-88th Ave., Suite 3, Edmonton, Alberta.

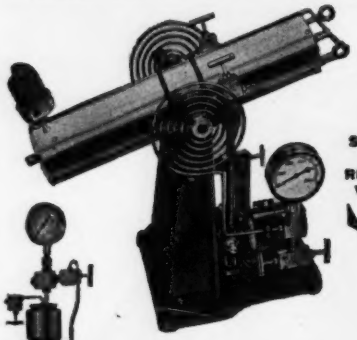
SELLING THROUGH SUPPLY STORES

HIGH-PRESSURE
REACTION VESSELS

VARIOUS types, with or without shaking or stirring mechanisms, heating jackets, and removable corrosion-resistant liners.

Standard volumes, 43 ml. to 20 liters, for pressures up to 60,000 psi and temperatures up to 800° F.

Vessels for continuous reactions can be built for pressures up to 100,000 psi and temperatures up to 2500° F.



SHAKING TYPE REACTION VESSEL

STIRRING TYPE REACTION VESSEL

OTHER AMINCO SUPERPRESSURE PRODUCTS

- **REACTION VESSELS**
- **VALVES • FITTINGS**
- **TUBING • PUMPS**
- **COMPRESSORS**
- **INSTRUMENTS**
- **DEAD-WEIGHT GAGES for pressures up to 100,000 psi.**

30 YEARS EXPERIENCE
As pioneers – and still leaders, in the superpressure field, Aminco has an unmatched fund of experience which is at your disposal for the solution of your specific high-pressure problems.

Write for catalogue 406-Q.

Superpressure Division
AMINCO AMERICAN INSTRUMENT CO.
8010 GEORGIA AVENUE · SILVER SPRING, MARYLAND

READERS' VIEWS, *cont. . .*

A further problem is to improve the high temperature resistance of resins and plastics. The ultimate would be a flameproof or, preferentially, fireproof product.

Finally, why do resin and plastic products fail on exposure to the elements? Answer this question and provide an economical solution and the plastic automobile, the plastic house, and other similar potentialities will become realities.

R. H. KIENLE
Director of Application Research
Calco Chemical Division
American Cyanamid Co.
Bound Brook, N. J.

Put Statistics to Work

Sir:

I was extremely interested in Dr. P. Ferencz's article in your April issue: "Statistics Can Put More Meaning Into Your Cost Estimates."

I should feel obliged for information about textbooks on statistics that would be well suited for practical purposes such as these. . . .

A. DE JAER
Technical Dept.
Societe Generale des Minerais
Brussels, Belgium

▶ *For our many readers who've written in to tell us how much they liked Dr. Ferencz's way of putting statistics to practical use: We plan to have more of the same before the year's out.*—ED.

Keep Unit Operations

Sir:

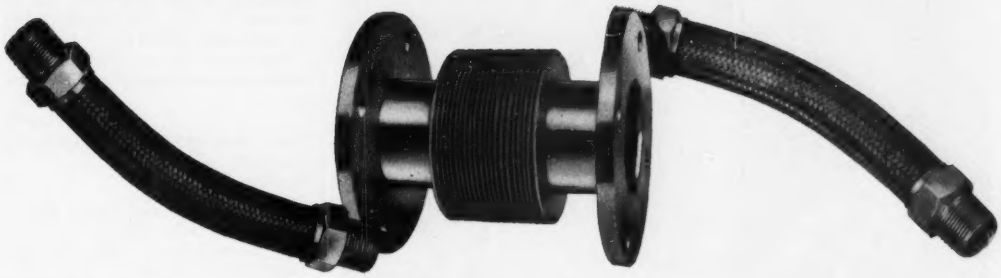
We have read and reread your review of our book "Chemical Engineering Techniques" and we certainly want to thank you for your completely delightful "interview" and your gracious and unusually thoughtful analysis of our new text.

If others, and particularly students, are led to similar conclusions relating to the objectives presented in the book, our purpose in preparing this material will have been realized.

We do want to point out—and most emphatically—that we have had no thought of discarding the unit operations concept of chemical engineering. We are reasonably certain that we would provoke a thoroughly indignant reaction from our friends in the profession if they thought we had that end in mind.

What we are trying to do is to round out the unit operations view of chemical engineering practice. We feel that most students are much too concerned with the unit operations as separate entities without their at-

Are these 3 new to you?



It would pay you to know all about them

Don't let their modest appearance fool you; these are puzzle-busters and job-simplifiers extraordinary.

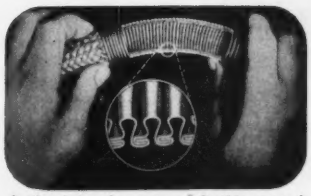
This is **TITEFLEX®**—*the* All-Metal Flexible Hose with 1001 industrial applications. It withstands temperatures, pressures, vacuum, vibration and the corrosive action of a host of liquids and gases. How can you use it? To connect moving parts of machinery. To connect misaligned parts. To absorb vibration, contraction, expansion and pulsation. To "transmit" vacuums or convey high-frequency currents. To shield wire and cables. And to handle difficult materials—from acid and ammonia to sea water or steam.

Here's **UNIFLEX**—the new *Helically-corrugated* Seamless Flexible Tube. It's tough, corrosion-resistant, leak-proof. And its *helical* construction gives it greater flexibility and longer life in applications too critical for ordinary concentric tubing. UNIFLEX is for you—if you're concerned with hydraulic lines, oil burners, refrigeration machinery, air conditioning equipment, pumps, compressors, diesels or machine tools. For leakless service, UNIFLEX fittings have metal-to-metal seat. Seal is produced through spring washer effect of hose on fitting body.

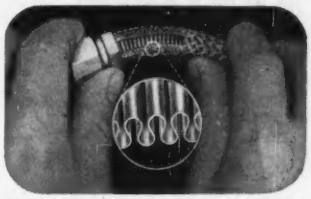
TITEFLEX BELLOWS are the *efficient* means of absorbing lineal movement in many types of equipment. Their welded, convoluted-diaphragm construction lets them do this without weakening the lines in which they are inserted and without reducing the flow rates of gases or liquids being conveyed. You can use TITEFLEX BELLOWS to seal high pressure valves and shafts, accommodate lineal contraction and expansion or high frequency vibration, and to handle gases and corrosive liquids under high temperature conditions. Special designs are available and complete bellows assemblies can be furnished with any required types of fittings.

Get the facts without obligation

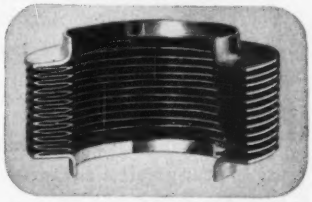
TITEFLEX literature contains full descriptions, technical data and suggestions for use. And Titeflex Designers and Engineers have a thorough knowledge of these products' behavior under exacting service conditions. Check the products that interest you and mail the coupon today. We'll be glad to help you with any specific problem.



Sectional view shows rugged, flexible, seamed construction of Titeflex.



Note the helically-corrugated, seamless wall structure of Uniflex.



Cross-section shows the welded, convoluted-diaphragm construction of Titeflex Bellows.

Let Our Family of Products Help Yours

Titeflex

✓ Check products you are interested in.

☐ SEAMED AND SEAMLESS METAL HOSE

☐ PRECISION BELLOWS

☐ IGNITION HARNESS

☐ IGNITION SHIELDING

☐ ELECTRICAL CONNECTORS

☐ RIGID AND FLEXIBLE WAVE GUIDES

☐ FILTERS

☐ FUSES

TITEFLEX, INC.
504 Frelinghuysen Ave.
Newark 5, N.J.

MAIL COUPON TODAY

Please send me without cost information about the products checked at the left.

NAME_____

TITLE_____

FIRM_____

ADDRESS_____

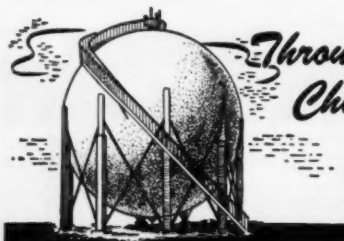
CITY_____ ZONE____ STATE_____

ASK THE
AEROFIN
MAN

For the Practical Answer to Your Heat-Exchange Problem...

There is a competent Aerofin heat-transfer engineer near you, qualified by intensive training and long experience to find the *right* answer to your own particular heat-exchange problem.

This specialized knowledge is there, ready for you to use to your greatest advantage. Ask the Aerofin man — and be right.



Throughout the Chemical Industry —

Aerofin units do the job Better, Faster, Cheaper

AEROFIN CORPORATION 410 South Geddes St. Syracuse 1, N. Y.

Aerofin is sold only by manufacturers of nationally advertised fan system apparatus. List on request.

tention being directed to the interrelationship of the operations and to the way in which the operations can be used most effectively.

We hope to enhance the unit operations concept rather than to discard it.

B. E. LAUER
Head, Dept. of Chemical Engineering
University of Colorado
Boulder, Colo.

► *We appreciate Author Lauer's kind remarks for our review (May, p. 381) of the new Lauer-Heckman book "Chemical Engineering Techniques."*

We're completely in agreement with the authors' objective—". . . to enhance the unit operations concept rather than to discard it"—and feel that they have taken a mighty big step toward that objective. The concept behind the book is fresh and stimulating.—ED.

Trouble With Gum Rosin

Sir:

We have experienced a peculiar series of events that may be of interest to your readers.

An exhaustive series of experiments were made with a mixture of gum rosin and other ingredients in an attempt to make a stable emulsion. The final formulation when tried out on a larger size batch did not give the desired result.

After carefully checking the various ingredients used, we found that the gum rosin was kept in a finely powdered state for a period of several weeks before use; during that time sufficient oxidation had occurred to completely destroy the balance required for proper emulsification. When this gum rosin was powdered just before use, no difficulty ensued.

H. MARTIN FRIEDMAN
Research Director
Emkay Chemical Co.
Elizabeth, N. J.

► *We're glad to pass along this interesting bit of information so that other people will know how to avoid this difficulty with gum rosin.*—ED.

When's a Boner a Boner?

Sir:

In a recent issue your "Little Boner" describes an error made in reading the hydrometer measuring the concentration of HCl in the product of an HCl absorber. Says the author: ". . . 28 percent acid and the surrounding countryside rapidly disappearing behind a fog of HCl gas from the vent."

If he were really getting 38 percent

acid, as it later turns out he was, why is the countryside disappearing?

CHARLES LAMBERT
Chemical Engineer
Foster Wheeler Corp.
New York, N. Y.

▶ *See the letter that follows for the reason why.*—ED.

When's a Fog a Fog?

Sir:

I feel we must now emerge from our coy anonymity and answer Mr. Lambert.

Admittedly, our physical and mental fog was thick at the time, but it would appear that some had floated as far as the U. S. A.

The whole point of our worry was, of course, the fact that we were producing 38 percent acid and didn't know it. With an apparent strength of 28 percent, we kept on pouring HCl gas into the system, getting no absorption in the already saturated acid; hence the bulk of the extra gas went straight through the system.

If Mr. Lambert doubts our fog, our local power supply authorities will be pleased to give adjectival evidence. Their comments on the state of their nearby circuit breakers, etc., are too sulphurous for your chaste journal....

J. E. BREWSTER
Learner Chemical Co., Pty., Ltd.
Melbourne, Australia

No, Not "Not"

Sir:

. . . your June issue (p. 164) says "Sherritt could not hope to get into production without putting up a big and costly smelting plant."

Doesn't the leaching process eliminate the need for smelting?

ARTHUR T. HINCHLEY
Trail, B. C.

▶ *It certainly does. Cut that "not." The whole story was on such a tight schedule that we could not delete the "not" which our printer gratuitously supplied.*—ED.

Instrumentation Reprints

Sir:

We were very much impressed with the section on Process Instrumentation in the May issue of *Chemical Engineering.*

I want to congratulate you on the fine job you did.

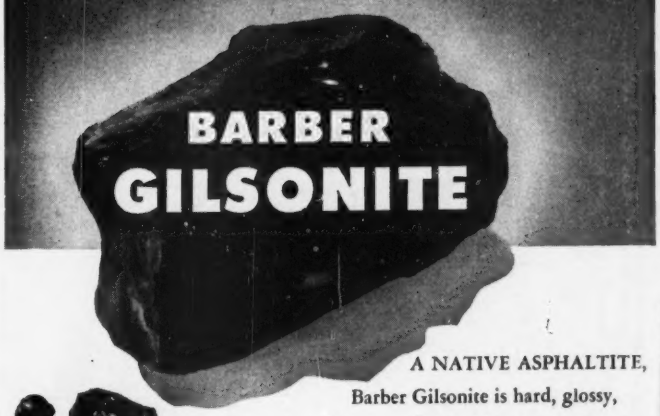
Please let us know whether reprints are going to be available.

G. P. LONERGAN
The Bristol Co.
Waterbury, Conn.

▶ *Thanks and yes. Reprints are now ready. For prices and discounts see the ad on p. 495.*—ED.

INVESTIGATE THE UNUSUAL PROPERTIES OF

BARBER GILSONITE



A NATIVE ASPHALTITE, Barber Gilsonite is hard, glossy, brittle, and has an extremely high melting point. Chemically inert, Barber Gilsonite may have important values in your processes. We'll be glad to supply samples and specific data promptly on receipt of your request.

5 USEFUL GRADES

BARBER GILSONITE SELECTS L
Melting Point Range 270-300° F.

BARBER GILSONITE SELECTS PULVERIZED
Melting Point Range 280-310° F.

BARBER GILSONITE SELECTS VB
Melting Point Range 325-365° F.

BARBER STANDARD GILSONITE S
Melting Point Range 280-310° F.

BARBER STANDARD GILSONITE E
Melting Point Range 335-375° F.

IMPORTANT INDUSTRIAL USES

BUILDING MATERIALS • Barber Gilsonite is used as an important ingredient in building materials: floor tiles; building boards and paper; protective coatings and roofing lines.

MOLDED PRODUCTS • Barber Gilsonite is a principal component in battery cases and other thermoplastic molded products.

ELECTRICAL PARTS • For its high insulating value, Barber Gilsonite has wide application in electrical products and insulating varnishes.

SPECIAL APPLICATIONS Wax and rubber compounds Printing Inks • Sounds and weather-proofing materials • Pipe Coatings • Chassis paints • Brake and clutch linings.

AMERICAN Bitumuls & Asphalt COMPANY

200 BUSH ST. • SAN FRANCISCO 4, CALIFORNIA

Providence 14, R. I. Perth Amboy, N. J. Baltimore 3, Md. Columbus 15, Ohio
St. Louis 17, Mo. Mobile, Ala. Baton Rouge 2, La. Tucson, Ariz. Inglewood, Calif.
Oakland 1, Calif. Portland 7, Ore. Seattle, Wash. Washington 6, D. C. San Juan 23, P. R.

Custom Built

STAINLESS STEEL EQUIPMENT....

...is ONLY AS GOOD AS ITS FABRICATOR

From the minute you decide on a made-to-order stainless steel vessel, you're in the hands of a fabricator. In fact the selection of your fabricator is generally one of your big problems.

It's more than a question of following blueprints. Stainless steel is a difficult alloy to work. It "acts up" during fabrication. In cutting, forming, welding and even in finishing, your fabricator must know how to guard the corrosion resistance and strength of the alloy. His plant must be specially equipped for working with stainless steel. The longer his experience, the more help he'll give you in building vessels that meet your requirements.

We work exclusively with stainless steel and alloys. Our plant is specially tooled to fabricate this metal. Our engineers and mechanics are particularly trained for the work. Why not consult us when you plan your next stainless steel vessel?

S. BLICKMAN, INC. • 607 GREGORY AVENUE • WEEHAWKEN, N. J.

S. BLICKMAN, INC.
Guards Alloys in Fabrication

SEND FOR THIS VALUABLE BOOK

A request on your letterhead will bring our guide, "What to Look For When You Specify Stainless Steel for Your Processing Equipment."

CORROSION RESISTANT PROCESSING EQUIPMENT

TANKS • KETTLES • STILLS • HEAT EXCHANGERS • AGITATORS • MIXERS • TOWERS • PIPING

LITTLE BONER

Whodunit?

The last four or five mornings we had found our electric "Mettler" balance about 35 or 40 cm. off balance.

It has a small bulb at the side and the beam of light is directed through a series of prisms onto a frosted glass on the front of the balance. The vernier scale is on the frosted glass and the reading is taken at the point where the lines reflected on the glass coincide with the vernier.

Temperature changes were considered, but even with the weather we have been having, it shouldn't be off 35 cm.! Also the lines reflected onto the frosted glass grew dimmer each day.

The first few times we just moved the set screws and re-balanced the scale. Then when the lines became so dim we could hardly see them, we wiped the electric bulb off, thinking dirt had covered it. The light did come through much better.

It was eerie to see the thing off balance every morning. No human hands had touched it all night. All the other balances were fine!

Our boss bravely discounted the theory of ghosts working on the night shift and really took it apart and cleaned it. Every part was checked and brushed. Everything was in order including a small diaphragm on the beam.

The balance was put back together and, sure enough, the lines could be seen much better. "Just a little dirt," said our boss, and the matter was dropped.

That is, it was dropped until the next morning when again our balance was off—way off!

Then our boss had an idea. The little white diaphragm—what was it doing there? He didn't know what it was for and it was right on the end of the beam. The light would have to pass through the diaphragm to the frosted glass—and the balance had GAINED weight these mornings, hadn't it? He lifted the beam out and there it was! The little white diaphragm was a white spider web!

A spider had got in the balance and decided that the round hole, about 0.75 in. in diameter, was a good place to make a home. The web was perfect with no guide lines any where in the balance to give it away. From all appearances, it was a perfect diaphragm.

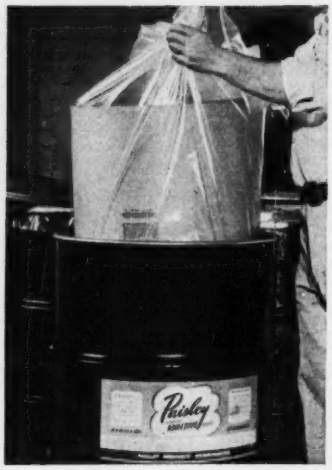
If you have a true "Little Boner," why not pass it along? Address the Editor, *Chemical Engineering*, 330 West 42nd St., New York 36, N. Y.

SWENSON EVAPORATOR CO.
DIVISION OF WHITING CORPORATION
15670 Lathrop Avenue Harvey, Illinois
Sales Offices in Principal Cities. Export Department: 30 Church Street, New York 7, N. Y.
In Canada: Whiting Corporation (Canada) Ltd., 185 Eileen Ave., Toronto 9

IN THE manufacture of pharmaceuticals, as well as foods and chemicals, Swenson Spray Dryers speed the production of uniform quality products at low cost. At Upjohn's, Swenson spray drying is an important step in processing *Somagen*, a preparation of proteins and carbohydrates reinforced with vitamins.

saves

FIBER DRUM with VISQUEEN LINER
A sure way to save on hydroscopics. VISQUEEN locks out moisture, prevents lumping or caking. Use this combination for your most "difficult" products, even wet or greasy.



STEEL DRUM with VISQUEEN LINER
No leakage. No cleaning or reconditioning. 100% recovery and purity. VISQUEEN prevents any reaction from metal, doesn't stick or cling no matter how messy or sticky product is.

money in every weigh

RECTANGULAR CARTONS with VISQUEEN VISQUEEN film liners may be used for any size rectangular cartons, for low cost, convenient shipping of foods and other products in semi-liquid or solid form. Investigate this new packaging technique.

IMPORTANT!

VISQUEEN film is all polyethylene, but not all polyethylene is VISQUEEN. VISQUEEN is the only film produced by process of U. S. Patent No. 2461975. Only VISQUEEN has the benefit of research and extensive technical experience of The Visking Corporation, pioneers in the development of polyethylene film.

3 VISQUEEN

packaging methods to save up to 66% shipping costs— guarantee 100% product purity!

Shippers of liquids, (corrosive or not), semi-liquids or solids no longer are forced to pay the heavy tare price of containers which often weigh as much, if not more than the product itself. VISQUEEN film liners in fiber drums, steel drums and cartons combine full, 100% product protection with big reductions in weight.

Example: a VISQUEEN liner and "boot" in a fiber drum is 50 to 75% lighter than alternative containers, and successfully carries 400 lbs. of liquids for a manufacturer under all types of normal handling abuse. Approved by the American Trucking Association. Accidental falls and bumps which might shatter rigid containers, leave VISQUEEN unaffected because of its high tensile strength, uniformity and flexibility.

These money-saving VISQUEEN applications resulted from closely-knit teamwork between VISQUEEN and VISQUEEN converters. Converters who have VISQUEEN'S superior technical resources and vast experience at their command. The *only* ones in their field who can put VISQUEEN engineers and chemists in your plant to work on your problem . . . to make sure the better packaging that always spells economy.

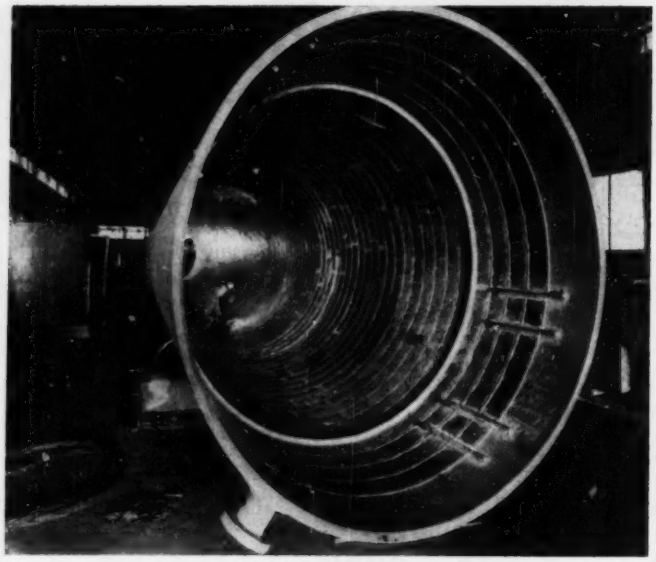
Write for a complete list of VISQUEEN converters in your area. *Do it better—do it with VISQUEEN.*

VISQUEEN* film...a product of

THE VISKING CORPORATION

Preston Division, Terre Haute, Indiana • In Canada: Visking Ltd., Lindsay, Ontario

*T. M. The Visking Corporation



This 63-ft. isomerization tower is being lined with Hastelloy alloy B.

Hastelloy Alloy B

The corrosion resistance of this nickel-molybdenum alloy to 190 corrosives, with data on mechanical properties, applications and forms available.

EDWARD D. WEISERT
Haynes Stellite Co., Kokomo, Ind.

Hastelloy alloy B is another one of the series of nickel-molybdenum-iron alloys specially developed to resist certain severe conditions of chemical corrosion. It is particularly well suited for equipment handling hydrochloric acid at all concentrations and temperatures, including the boiling points, and also wet hydrogen chloride gas. Only tantalum and some of the precious metals offer similar resistance to these severely corrosive media. Alloy B also has good resistance to sulphuric acid and phosphoric acid. The chemical composition range of the alloy is shown in Table I, and some of its mechanical properties in Table II.

Table I—Chemical Composition of Hastelloy Alloy B, Percent:

Mo	26–30	C	0.12 max.
Fe	4–7	Mn	1.0 max.
Cr	1.0 max.	Ni	Balance
Si	1.0 max.		

Table II—Mechanical Properties of Hastelloy Alloy B (Room Temperature-Annealed)

	Wrought	Cast
Ultimate strength, psi.	130–140,000	75–85,000
Yield strength, psi. (0.2% offset)	56–62,000	55–60,000
Elongation, percent	50–55	6–10
Hardness, Rockwell B.	92–98	89–99
Impact strength, Izod, ft. lb.	58–62	10–15
Modulus of elasticity, psi.	30,750,000	26,500,000

Because of its excellent corrosion resistance, Alloy B is used in many industries as a material of construction. It is available in wrought form as sheet, plate, bar stock, drawn wire, and welded and drawn tubing. Fittings, pump, and valve parts, and other forms can be supplied as sand castings or as precision investment castings. The alloy is also available in the form of welding rod and coated electrodes.

In microstructure and working properties, this nickel-base alloy is similar to the austenitic stainless steels. Alloy B possesses ample room-temperature ductility for cold-working operations. The alloy has a tendency to work-harden, however, and requires more intermediate anneals during severe forming than do the austenitic stainless steels. It is recommended, too, that a final sizing operation be performed after cold-forming parts that require close dimensional accuracy. This should be done after the part has been formed to at least 90 percent of its final shape. The part should then be fully annealed and pickled.

Hastelloy alloy B can be welded by the metallic-arc, atomic hydrogen, Heliarc, Unionmelt, and oxy-acetylene processes. Heliarc welding is preferred for joining wrought material. Since Alloy B has a low carbon content, care should be taken to avoid carbon pickup when welding this alloy by the oxy-acetylene process. The alloy becomes hot-short in the 1,100 to 1,500 deg. F. range. It is important, therefore, that excessive stresses be avoided during welding.

Full annealing of a vessel fabricated from Hastelloy alloy B prior to service in severe corrosive media is recommended. For less drastic conditions, the as-welded condition is often satisfactory. Grain boundary precipitation caused by welding is usually slight if proper welding techniques are used. Applications such as boiling hydrochloric acid are considered severe, and any vessel should be fully annealed to handle them. This can be accom-

Notice . . .

This is the eighth in a series of chart data presentations giving corrosion data for various materials of construction vs. a number of corrosives. Data for the corrosives of particular interest to you will be increased as the coverage grows to include all of the major materials of construction.

Coming:
Hastelloy D, August 1952
Carbon & Graphite, September 1952

Already Published:
Furane Cements, December 1951
Phenolic Cements, January 1952
Sulphur Cements, February 1952
Silicate Cements, March 1952
Tantalum, April 1952
Aluminum, May 1952
Hastelloy C, June 1952

Reprints of those already published are available at 25c. each. Address Editorial Dept., Chemical Engineering, 330 West 42nd St., New York 36, N. Y.

Banish Corrosion with "KARBATE" BRAND Impervious Graphite Towers

"KARBATE" TOWERS do more than retard corrosion – they eliminate it *entirely* from such processing operations as absorption, fractionation, evaporation, extraction, scrubbing, and many others. Furthermore, the widespread acceptance of impervious graphite for all types of corrosion-free process construction has resulted in the manufacture of monolithic tower sections and fittings in sizes to 24" I.D.

For example, the tower illustrated here incorporates the following standard components: *bottom section* with gas inlet, liquor outlet and support grill; *intermediate section* with hand hole and packed with carbon Raschig rings; *short intermediate section; top section* with "Karbate" feed assembly and wier plate distributor; and *cover* with gas outlet. All sections and fittings, including spring-loaded tie rods and heavy-steel pressure plates, are available for quick assembly to your specifications.

All openings are of adequate size. Generous gas-liquid disengaging space is provided in the top and bottom sections.

"Karbate" Impervious Graphite is in widespread use today. The increasing demand for corrosion-free processing equipment indicates that it will be the universally preferred construction material of tomorrow. For *only* impervious graphite can give you this unique combination of properties:

- **STRENGTH AND EASE OF INSTALLATION**
- **SIMPLICITY OF FABRICATION AND MODIFICATION IN THE FIELD**
- **HIGH HEAT CONDUCTIVITY**
- **RESISTANCE TO CORROSION AND THERMAL SHOCK**
- **NON-CONTAMINATION**

The term "Karbate" is a registered trade-mark of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street, New York 17, N. Y.

District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

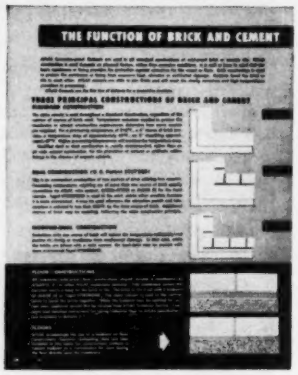
In Canada: National Carbon Limited, Montreal, Toronto, Winnipeg

OTHER NATIONAL CARBON PRODUCTS

HEAT-EXCHANGERS • PUMPS • VALVES • PIPING • TOWERS • TOWER PACKING • BUBBLE CAPS • BRICK • STRUCTURAL CARBON • SULPHURIC ACID CUTTERS • HYDROCHLORIC ACID ABSORBERS

. . . a practical guide to Corrosion-proof cements

NEW, INFORMATIVE BULLETIN AVAILABLE WITHOUT OBLIGATION



HERE in concise form you will find complete data on the basic types of corrosion-proof cements and constructions. Each cement is graphically shown in its relationship to temperature and the broad classes of corrosives handled.

In addition, RESISTANCE TABLES are included which cover 176 common corrosives, and relate them to cements satisfactory for that service. And, ESTIMATING TABLES guide you in figuring not only cement, but also brick requirements for most corrosion-proof construction jobs.

SEND FOR YOUR COPY OF BULLETIN 5-2 TODAY

ATLAS MINERAL PRODUCTS COMPANY

ATLAS PRODUCTS STAND . . . between your process and corrosion.

101 CHESTNUT STREET
MERTZTOWN, PENNSYLVANIA
Plant also at Houston, Texas

Corrosion-proof: Cements . . . Coatings . . . Linings

plished by holding the vessel at a temperature between 2,125 and 2,150 deg. F. for at least an hour, then cooling it rapidly—preferably by water-quenching or spray-cooling. This anneal fully stress-relieves a vessel and dissolves any precipitated constituents. Also, the long soak serves to break up the cast structure of the welds.

The alkylation of benzene to ethyl benzene for styrene production is typical of the Friedel-Crafts type syntheses to which Hastelloy alloy B equipment is successfully used. In such service, the alloy resists attack from the aluminum chloride—hydrogen chloride complexes that serve to catalyze the process. Another typical application is the use of Hastelloy alloy B to line large isomerization towers for the production of aviation gasoline. One of these towers, which was strip lined, is shown here.

Hastelloy alloy B, besides having unusual resistance to hydrochloric acid and chloride-bearing solutions, is resistant to a wide variety of other corrosive media. This will be seen in the temperature-concentration charts that follow. The major resistance displayed by alloy B is to reducing conditions. Strongly oxidizing agents, therefore, are to be avoided. The presence of cupric, ferric, or other oxidizing ions tend to accelerate attack of the alloy.

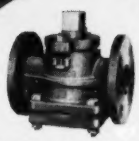
Because it also has good high-temperature properties, Hastelloy alloy B is being employed for such parts as turbo-supercharger buckets and jet-engine blading, and other applications where both severe operating conditions and severe corrosive conditions are encountered.

The charts that follow are limited in scope and cannot take into account the many factors that must be considered in the selection of a corrosion-resistant alloy for a particular application. It should be pointed out that the boiling point of all solutions is plotted simply at the boiling point of water. Also, in complex mixtures, where the exact concentration of the main corrodant is not known, the 100 percent concentration line is used.

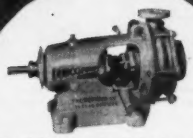
Symbols on these charts denote various ranges of corrosion rates, expressed as inches per year. A triangle is used to identify corrosion rates that fall below 0.002 inches per year, a circle for those corrosion rates that fall below 0.02 inches per year, a square for those corrosion rates that fall between 0.02 inches per year and 0.05 inches per year, and an inverted triangle pointing downward to denote those corrosion rates exceeding 0.05 inches per year. These rates are, of course, in the order of decreasing usefulness of the alloy under consideration.

Write for reasons why DURCO equipment—in DURCO alloys—works better, lasts longer, solves your corrosion problems

These DURCO products are representative of the DURCO family of engineered equipment. All are designed to operate at peak efficiency and are manufactured in special DURCO alloys to withstand severe corrosion.



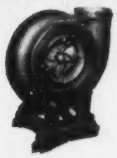
Durco F Valve. Non-sticking, non-lubricated. Teflon sleeve eliminates metal-to-metal contact. Highly satisfactory in toughest chemical service. Sizes: ¼" through 2".



Series R Durcopump. A heavy duty centrifugal pump for severe corrosive service. Available with interchangeable wet end parts in special Durco alloys for most corrosive conditions.

Duriron Acidproof Pipe. Highly resistant to almost all commercial acids at practically all concentrations and temperatures. Installed by usual plumbing methods as permanent lines.

Durco Heat Exchangers. Simple and efficient units for heating or cooling corrosive liquids. Designed for flexibility in mounting. Available in several DURCO alloys.



DURCO Exhaust Fans can be obtained in sizes, drives and capacities to meet most requirements. Available in Duriron and Durichlor.

THE
DURIRON COMPANY, INC.

DURCO

DAYTON, OHIO

THE DURIRON COMPANY, Inc.
DAYTON, OHIO

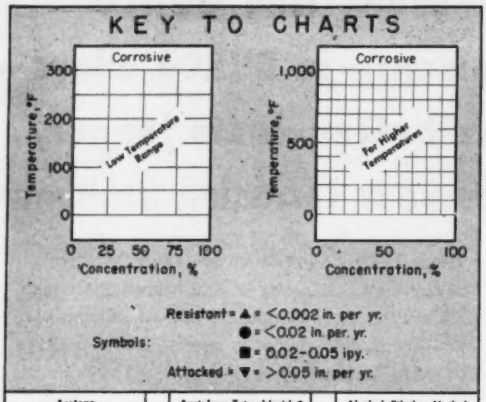
Please send me the Bulletins checked.

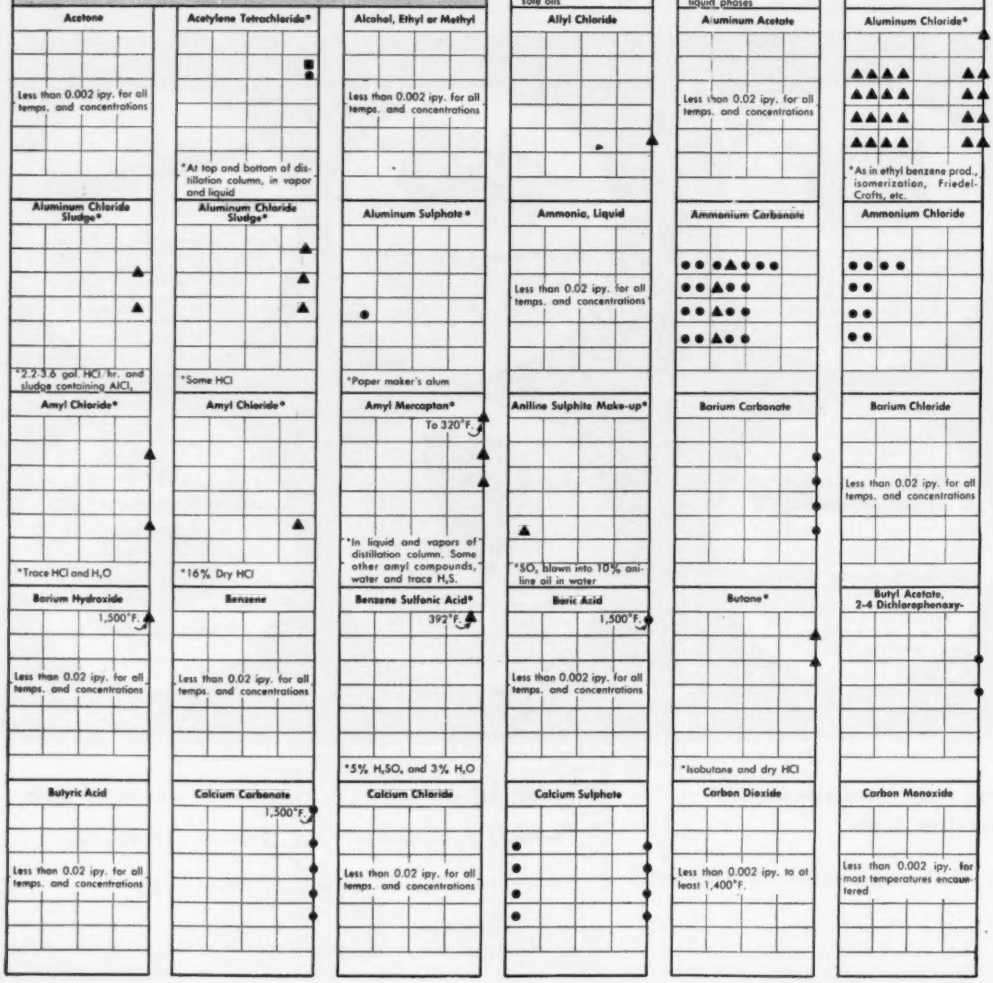
- ☐ Bulletin 647—F Valves
- ☐ Bulletin P/1—Durcopumps
- ☐ Bulletin PF/1—Pipe and Fittings
- ☐ Bulletins on Heat Exchangers
- ☐ Bulletin M7/1103—Fans
- ☐ General Catalog 53

Name..... Company..... Title.....

Address..... City..... State.....

Corrosion Resistance of Hastelloy B




Acetone
Less than 0.002 ipy. for all temps. and concentrations
Acetylene Tetrachloride*
*At top and bottom of distillation column, in vapor and liquid
Alcohol, Ethyl or Methyl
Less than 0.002 ipy. for all temps. and concentrations
Aluminum Chloride Sludge*
*2.2-3.6 gal. HCl/hr. and sludge containing AlCl,
Aluminum Chloride Sludge*
*Some HCl
Aluminum Sulphate*
*Paper maker's alum
Amyl Chloride*
*Trace HCl and H,O
Amyl Chloride*
*16% Dry HCl
Amyl Mercaptan*
To 320°F.
*In liquid and vapors of distillation column. Some other amyl compounds, water and trace H,S.
Barium Hydroxide
1,500°F.
Less than 0.02 ipy. for all temps. and concentrations
Benzene
Less than 0.02 ipy. for all temps. and concentrations
Benzene Sulfonic Acid*
392°F.
*5% H,SO, and 3% H,O
Butyric Acid
Less than 0.02 ipy. for all temps. and concentrations
Calcium Carbonate
1,500°F.
Calcium Chloride
Less than 0.02 ipy. for all temps. and concentrations
Acetic Acid*
*Aerated or non-aerated
Acetic Acid*
*Propionic and higher acids, 2-3% hardwood tar creosote oils
Allyl Chloride
Ammonia, Liquid
Less than 0.02 ipy. for all temps. and concentrations
Aniline Sulphite Make-up*
*SO, blown into 10% aniline oil in water
Boric Acid
1,500°F.
Less than 0.002 ipy. for all temps. and concentrations
Calcium Sulphate
Acetic Acid*
*Plus HCl to pH2.0, streptomycin purification
Acetic Acid*
*50% H,SO, — vapor and liquid phases
Aluminum Acetate
Less than 0.02 ipy. for all temps. and concentrations
Ammonium Carbonate
Barium Carbonate
Butane*
*Isobutane and dry HCl
Carbon Dioxide
Less than 0.002 ipy. to at least 1,400°F.
Acetic Acid*
*Also HCl in starch conversion
Acetic Anhydride
Less than 0.02 ipy. for all temps. and concentrations
Aluminum Chloride*
*As in ethyl benzene prod., isomerization, Friedel-Crafts, etc.
Ammonium Chloride
Barium Chloride
Less than 0.02 ipy. for all temps. and concentrations
Butyl Acetate, 2-4 Dichlorophenoxy-
Carbon Monoxide
Less than 0.002 ipy. for most temperatures encountered

(Continued on page 320)

paper sculpture by pauline pope

FILLING THE BILL

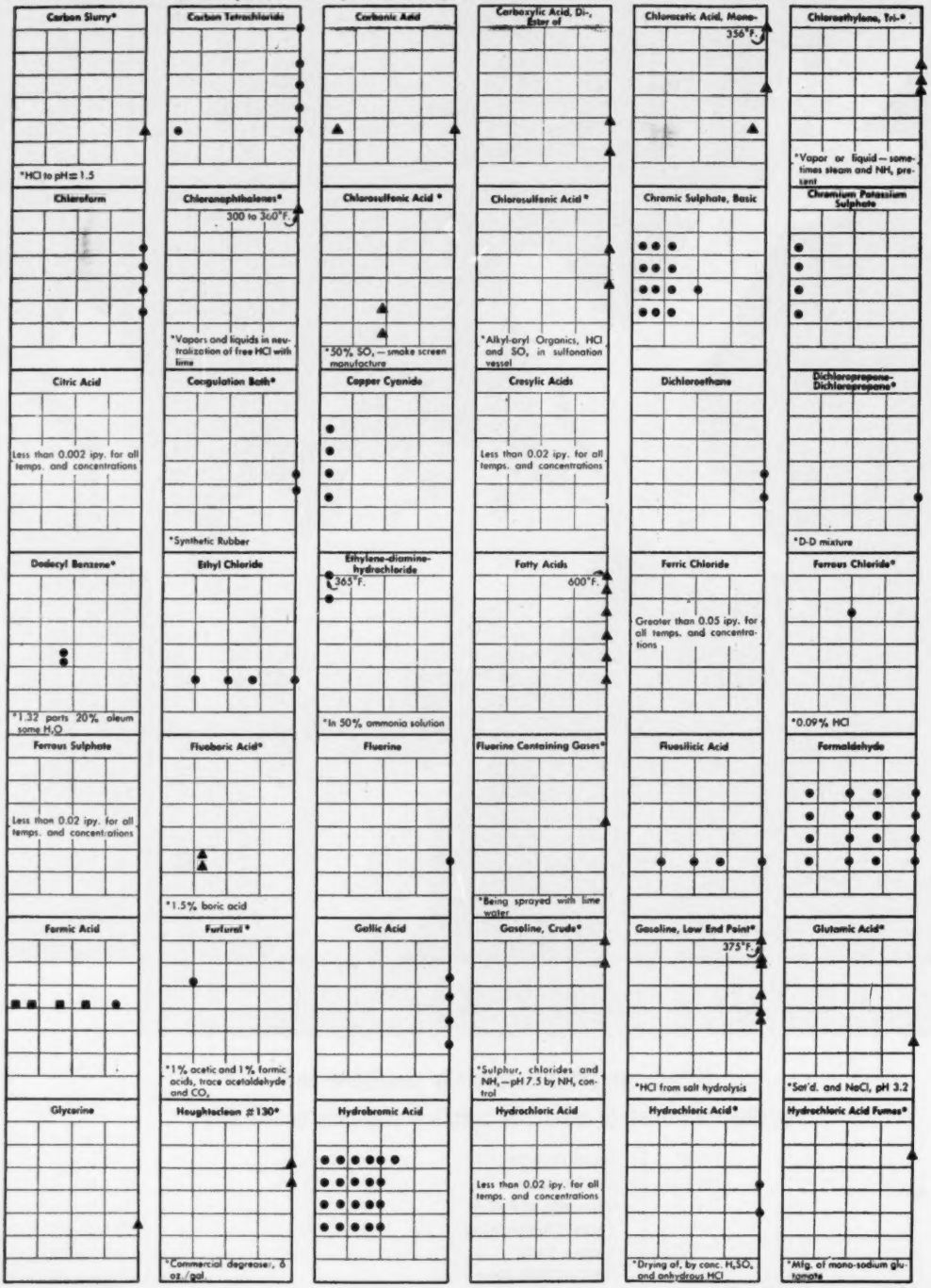
NIALK® products... specially developed and quality-controlled to meet the exacting demands of industry

NIALK	Liquid Chlorine
NIALK	Caustic Potash
NIALK	Carbonate of Potash
NIALK	Paradichlorobenzene
NIALK	Caustic Soda
NIALK	TRICHLORethylene
NIAGATHAL®	(Tetrachloro Phthalic Anhydride)

NIAGARA ALKALI COMPANY

60 East 42nd Street, New York 17, N. Y.

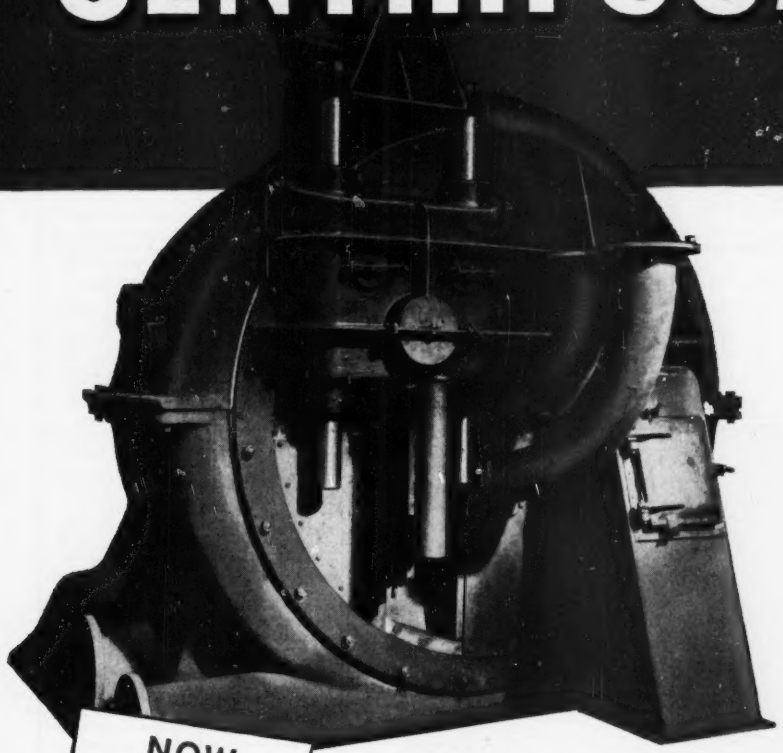
Corrosion Resistance of Hastelloy B (cont.). Key to charts on p. 318.



(Continued on page 322)

THE INTERNATIONAL

REINEVELD CENTRIFUGALS



NOW AVAILABLE IN THE UNITED STATES and Canada THRU...

For complete information on Reineveld Centrifugals write for booklet 5-RC-2

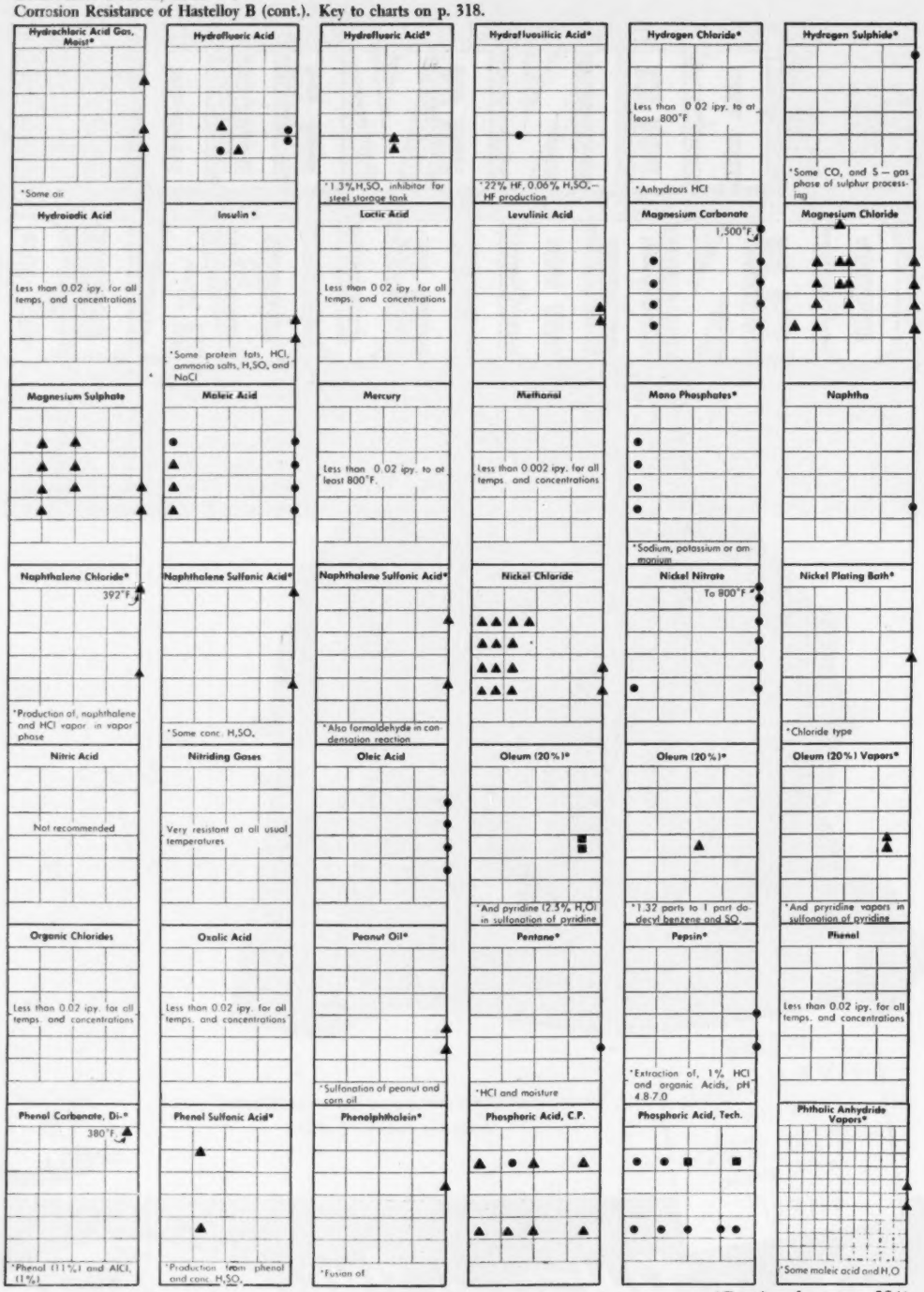
Heyl+Patterson, Inc.

"SINCE 1887"

55 WATER STREET · PITTSBURGH 22, PA.

Can You Tell Which of These Nordstrom Valves

Corrosion Resistance of Hastelloy B (cont.). Key to charts on p. 318.



(Continued on page 324)

Can You Tell Which of These Nordstrom Valves Are Designed for Chemical Services?

A

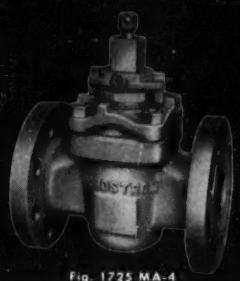


Fig. 1725 MA-4

B

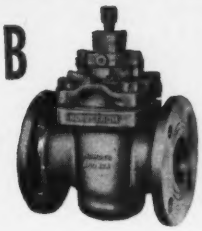


Fig. 1815

C

Fig. 614

A. This Nordstrom Valve is built of Type 316 Stainless Steel. It's recommended for oxidizing conditions such as nitric acid reactions. It is resistant to most organic acids and inorganic salts and alkalies.

B. Made of Monel, this valve is used in the food industries, along with nickel and stainless steel, for resistance to rust and corrosion. Sulphuric acid under reducing conditions may also be handled by it.

C. Like most Nordstrom process valves, this valve is available in screwed or flanged ends, straightway or multiport body patterns. It is Nordco Bronze, which is an acid resistant bronze for dilute sulphuric acid, organic acids, inorganic salts and alkalies.

D. A three-way Nordstrom Multiport valve may replace several straightway valves in process lines and also eliminate other fittings like tees and elbows. This valve is semi-steel, usually used in lines with cast iron pipe and fittings.

E. Often in batching, blending and other process applications, a gear operated valve may be needed. Here, a Nordstrom Hypreseal valve, for pressures to 2500 lb, is equipped for gear operation.

F. For handling caustic liquors in the sulphate pulp industry, viscose rayon plants, etc., this Nordstrom Valve of Type 2 Ni-Resist is widely used. It is also used in plastic and food industries and elsewhere where freedom from copper contamination is desired. It is also resistant to hydrogen sulphide as encountered in sulphide water, industrial water and petroleum oils.

G. Nordstrom valve of Hastelloy B, with Merchrome hard faced plug, is resistant to acid chlorides such as ammonia or zinc chloride. Not recommended for oxidizing conditions.

D

Fig. 3402

F

Fig. 1949

F

Fig. 5314

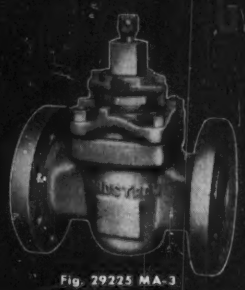


Fig. 29225 MA-3

In short, all of these Nordstroms are recommended for some types of process installations.

Nordstrom now builds a wide range of lubricant sealed valves for the chemical and process industries—many body patterns and pressure classes, sizes for nearly every line, flanged or screwed ends and a variety of most commonly specified erosion and corrosion fighting metals.

They're all described in the new bulletin, "Nordstrom Valves and Rockwell Meters for the Process Industries." Write for your copy.

Rockwell Built

Another ROCKWELL Product

Nordstrom Valves

Lubricant Sealed to Keep Upkeep Down

Rockwell Manufacturing Company

400 N. Lexington Ave., Pittsburgh 8, Pa.

Rockwell Manufacturing Company Dept. N5203D
400 N. Lexington Avenue
Pittsburgh 8, Pennsylvania

Please send me the new bulletin "Nordstrom Valves and Rockwell Meters for the Process Industries"

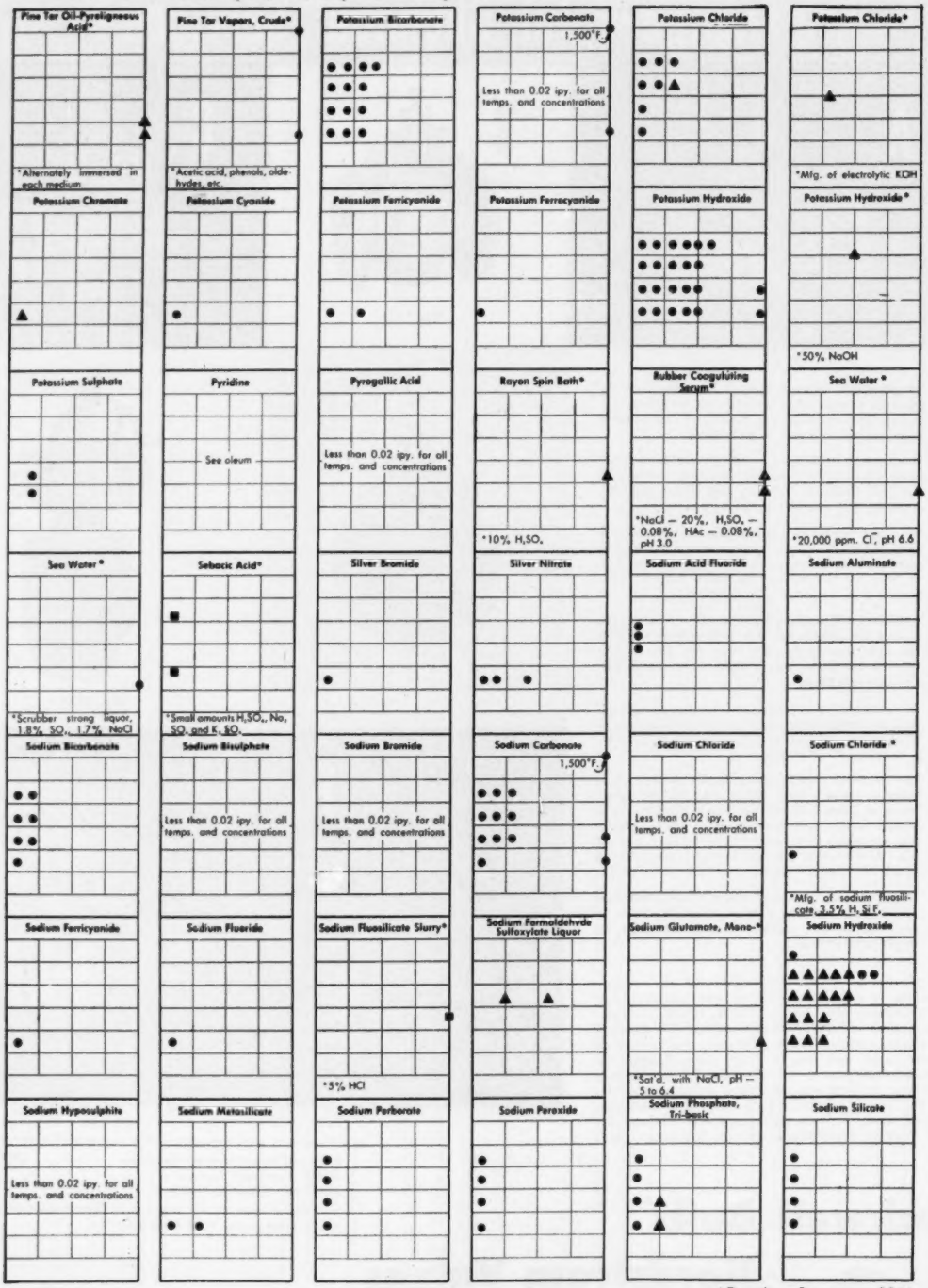
Name_____

Company_____ Title_____

Street_____

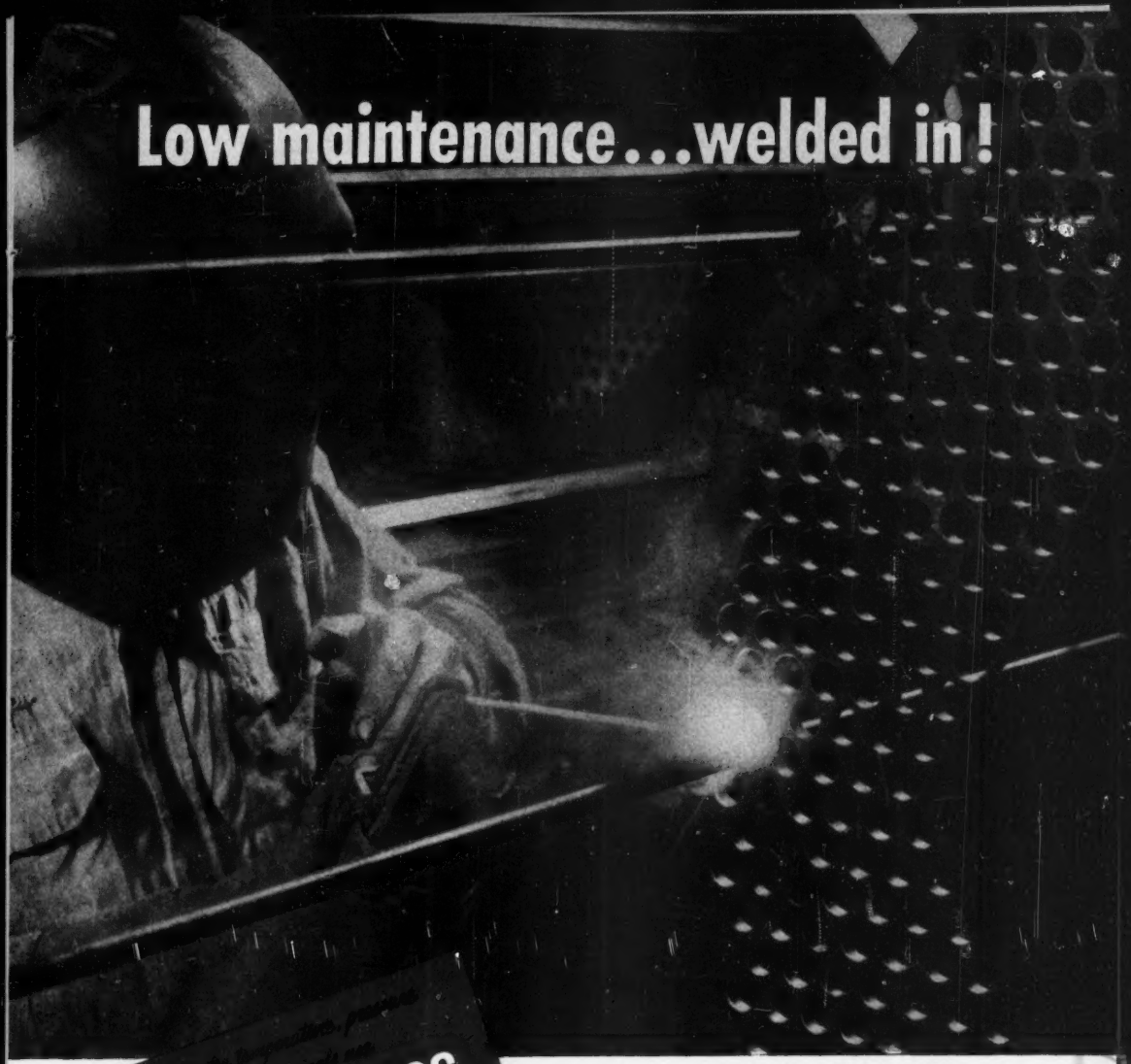
City_____ Zone____ State_____

Corrosion Resistance of Hastelloy B (cont.). Key to charts on p. 318.



(Continued on page 326)

Low maintenance...welded in!



M. W. KELLOGG

Such details as the positioning of this simple weld on an exchanger baffle plate can radically vary maintenance costs of an operating exchanger. Low maintenance costs have been a design fetish of Kellogg engineers for many years. They design with low maintenance as a principal "spec"...then see that the "spec" is reproduced in every piece of Kellogg-fabricated equipment.

Pressure Vessels
Vacuum Vessels
Fractionating Columns
Drums and Shells
Heat Exchangers
Process Piping
Hi-pressure—Hi-temp Power Piping
Bends and Headers
Forged and Welded Fittings
Radial Brick Chimneys

Continuing Basic Study of heat exchange by Kellogg development groups over 20 years has produced unduplicated design data.

Shop Layout Craftsmen have had experience on all types of heat exchangers, from marine condensers to jet engine combustion-chambers.

Rigid Quality Control is maintained by inspectors reporting directly to *Shop Management* rather than to *Production* executives.

Extensive Shop Facilities, from plate forming to stud threading, permit *complete* fabrication of any type heat exchanger.

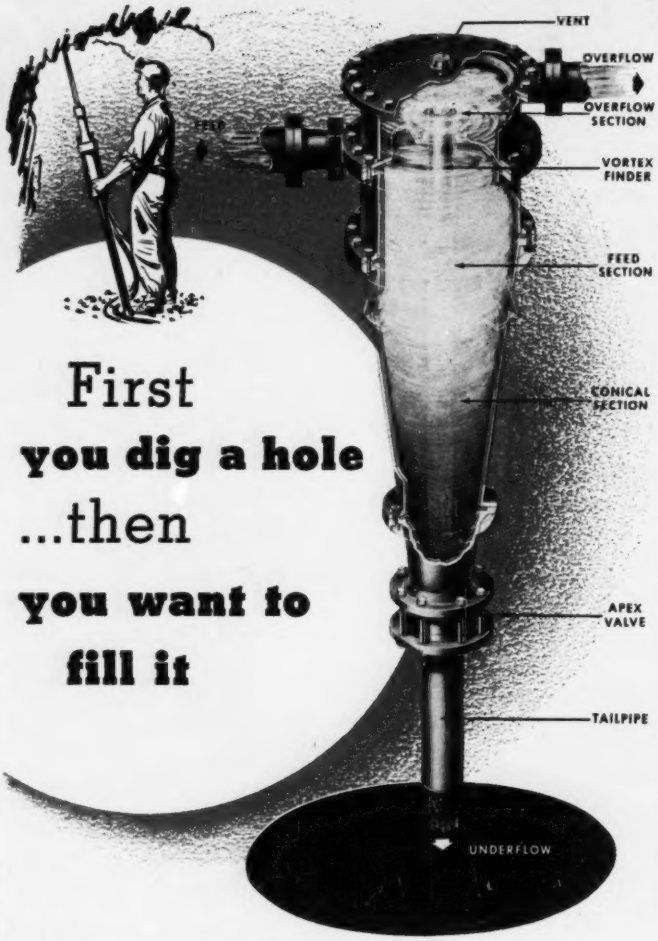
Special Shop Techniques—the component parts of each exchanger are fabricated as a production unit, building in the advantages of "tailor-made" fit.

FOR OPERATORS IN WESTERN CANADA!

The Canadian Kellogg Company Ltd. has established complete shop facilities for the fabrication of all types of piping at EDMONTON, Alberta. Inquire directly or through any Kellogg or Canadian Kellogg office.

KELLOGG

The M. W. Kellogg Company (A Subsidiary of Pullman Incorporated) New York, Jersey City, Los Angeles, Tulsa, Houston, Toronto, London, Paris



First
you dig a hole
...then
you want to fill it

Perhaps that hasn't happened to you — yet.

But it's happening every day to mine operators who have to fill stopes which could be hazards to mine safety. Producing mine backfill is just one use for the DorrClone*, a compact classification unit that uses centrifugal force in place of gravity. Its big advantages . . . sharp classification in the 20 micron to 150 mesh range and tremendous capacity for its size.

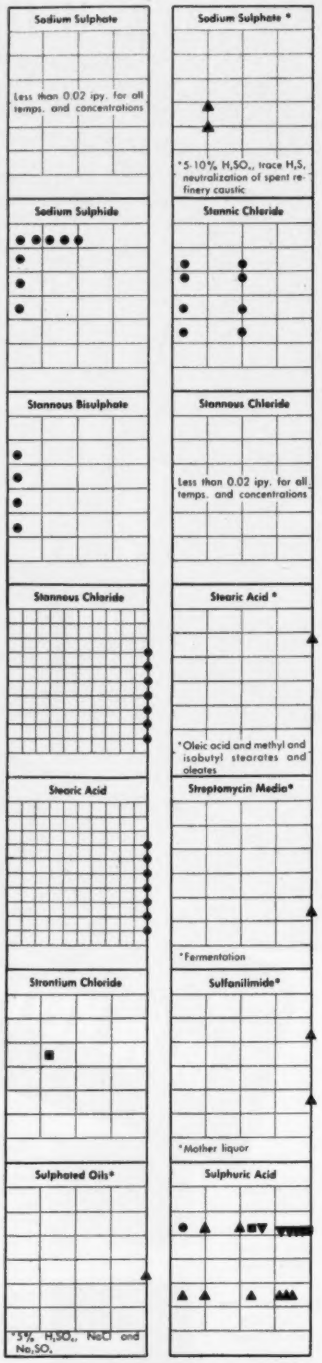
The DorrClone is just one of many new tools designed for greater processing efficiency. Whenever a process involves the separation of finely divided solids in suspension, the use of ion-exchange, or fluidizing techniques, the chances are that Dorr can provide the right equipment for your job.
THE DORR COMPANY, Barry Place, Stamford, Conn.

*Trademark of the Dorr Company

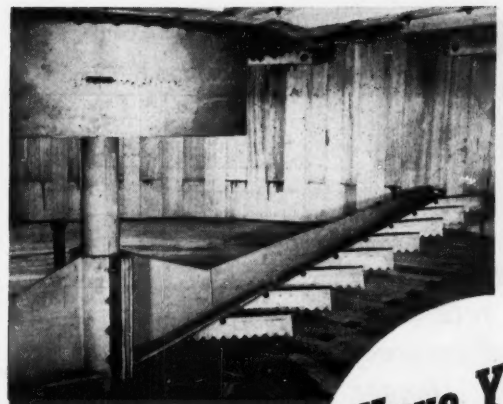
Better tools TODAY to meet tomorrow's demand.
DORR
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT
THE DORR COMPANY • ENGINEERS • STAMFORD, CONN.
Offices, Associated Companies or Representatives in principal cities of the world.

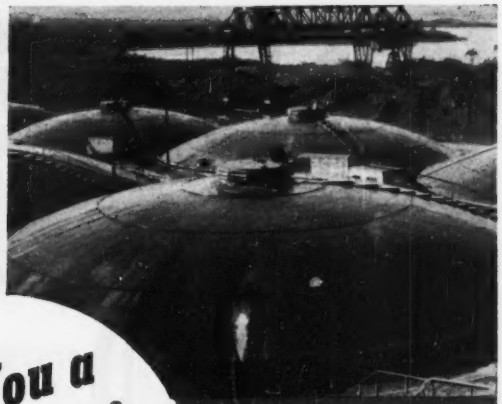
CORROSION FORUM, *cont. . .*

Hastelloy B (key on p. 318)

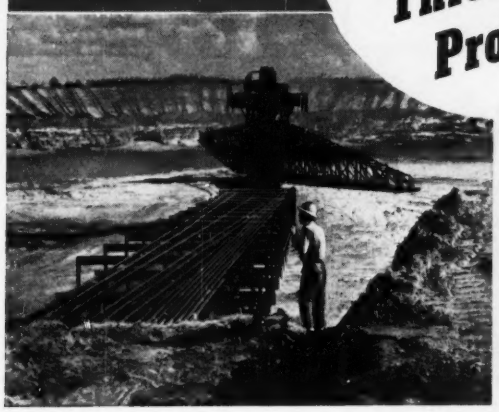


(Continued on page 328)





Have You a SPECIAL Thickening Problem?



Many thickening problems in the process industries can't be solved by standard methods. It's here that Dorr's ability to provide a special unit, tailor-made for the special job, pays dividends. Here are four recent examples. If your problem requires a fresh approach, why not check Dorr . . . the oldest manufacturer of sedimentation equipment . . . *with the newest ideas.* Write for your copy of Bulletin No. 3001 "Dorr Thickeners for chemical, metallurgical and industrial processing." The Dorr Company, Engineers, Stamford, Connecticut.

*Reg. U. S. Pat. Off.

Better tools TODAY to meet tomorrow's demand

DORRCO

DORR

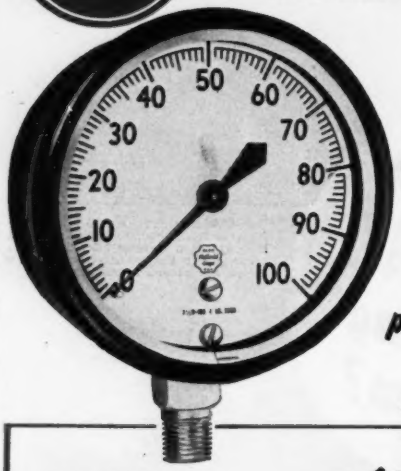
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

THE DORR COMPANY • ENGINEERS • STAMFORD, CONN.

Offices, Associated Companies or Representatives in principal cities of the world.

an ACCO product

HELICOID



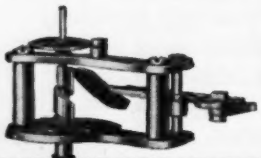
The gage that retains its original accuracy longer, lasts longer, costs less per gage, per year

NOW...a 3½" Gage

Now you can get the popular gearless Helicoid Movement in a 3½" Helicoid Gage for pressures from 100 lbs. to 10,000 lbs. and vacuum, in steel systems, or 15 lbs. to 1000 lbs. and vacuum, in bronze systems. Phenol or ACALOY case. Prominent black letters on white phenol dial. Stem, panel or flush mounting.

The Helicoid Movement is a simple cam and roller design that has no teeth to wear out. Tested and proved in years of hard service. Helicoid Gages give long, trouble-free service with little maintenance.

Only Helicoid Gages have the gearless Helicoid Movement, so look for the name Helicoid.



Write today
for the Helicoid Catalog

FOUR HELICOID FEATURES

1. Stainless Steel Helicoid Roller (no gear teeth)
2. Stainless Steel Hair Spring
3. Long Life Cam (no gear teeth)
4. Corrosion Resistant Link and Screws

ACCO

HELICOID GAGE DIVISION
AMERICAN CHAIN & CABLE

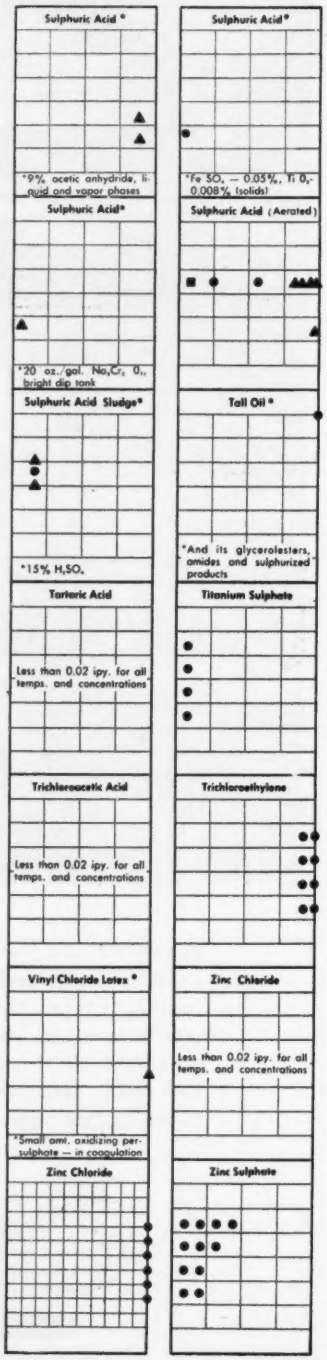
TRADE MARK

929 Connecticut Avenue • Bridgeport 2, Connecticut

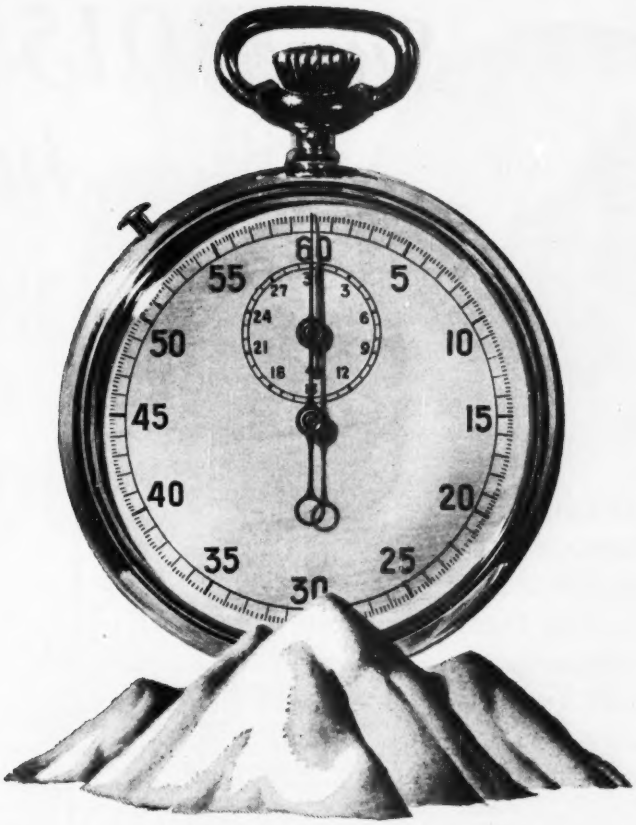
HELICOID Pressure • Vacuum GAGES

CORROSION FORUM, cont. . .

Hastelloy B (key on p. 318)


Sulphuric Acid *
*9% acetic anhydride, liquid and vapor phases
Sulphuric Acid*
*20 oz./gal. Na2Cr2O7 bright dip tank
Sulphuric Acid Sludge*
*15% H2SO4
Tartaric Acid
Less than 0.02 ipy. for all temps. and concentrations
Trichloroacetic Acid
Less than 0.02 ipy. for all temps. and concentrations
Vinyl Chloride Latex *
*Small amt. oxidizing persulphate — in coagulation
Zinc Chloride
Sulphuric Acid*
*Fe2SO4 — 0.05%, Ti2O3 — 0.008% (solids)
Sulphuric Acid (Aerated)
Tall Oil *
*And its glycerolesters, amides and sulphurized products
Titanium Sulphate
Trichloroethylene
Zinc Chloride
Less than 0.02 ipy. for all temps. and concentrations
Zinc Sulphate

—End



The minute you say the word!

The minute you say the word Kaiser Chemicals will supply you with the calcined and hydrated aluminas you need to build top quality into your product.

A major producer of aluminas for many years, Kaiser Chemicals is currently expanding its modern facilities to assure you prompt delivery.

You can also expect prompt service from Kaiser Chemicals' engineers—men who have spent years in solving the problems connected with the manufacture of abrasives, glass, ceramics, refractories, catalysts, chemicals for water treatment.

CALL US TODAY. We'll be on the job the minute you say the word. Principal sales offices: *Chemical Division*, Kaiser Aluminum and Chemical Sales, Inc., 1924 Broadway, Oakland, California. First National Tower, Akron, Ohio.

Kaiser Chemicals

calcined and hydrated aluminas

Alumina • Basic Refractory Bricks and Ramming Materials • Dolomite • Magnesia • Magnesite • Periclase

Since 1915 . . . a in the

ANTIBIOTICS
ANTI-KNOCK AGENTS
DDT, 2, 4-D, ETC.
FIBRES AND FABRICS
PETROCHEMICALS
PLASTICS AND RESINS
SOAPLESS SOAP
SYNTHETIC RUBBER

1952

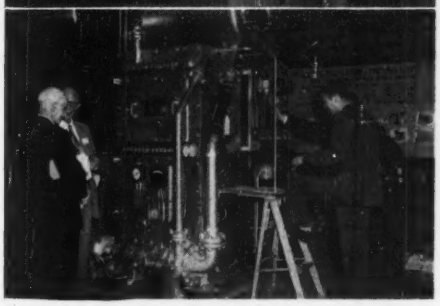
Come–
See–
Discuss–
Buy–

Photographs, Courtesy of THE LUMMUS COMPANY

EXPOSITION OF

mighty ever-growing force development of America's

CHEMICAL AND PROCESS INDUSTRIES



Thirty seven years ago—September 20, 1915—the first Exposition of Chemical Industries opened its doors at Grand Central Palace, New York City. There were 83 exhibitors; yet during the week-long "Show", 60,000 visitors came to see, discuss and buy equipment for the then infant chemical industry. The general public was admitted until 1923 when attendance had to be restricted to those who had business reasons to attend. As time went on, interest in the Exposition mounted, the number of exhibits doubled, tripled... industrial attendance increased. At the latest Chemical Exposition, in 1951, over 400 companies exhibited including many who have been consistent exhibitors from the very beginning . . . . . 46,705 interested visitors registered.

Today the Chemical Exposition is a recognized educational institution of tremendous benefit to engineers, executives, and operators. It is, as well, the recognized market place for all chemical industries and those under chemical control. Nowhere else is the inquiring chemical mind offered so great an opportunity for personal contact with the latest product and equipment developments for increasing efficiency and reducing costs. The Exposition is the gathering place of the Chemical and Process Industries. Today, looking toward ever-widening horizons of science, with new and improved products playing a vital part in our economy for peace or for war, the Exposition is, *as never before,* a live, vital, and compelling force in the development of America's Chemical and Process Industries.

With many challenges facing the Chemical Industries of today and tomorrow, future Expositions may prove the most important yet to be held.

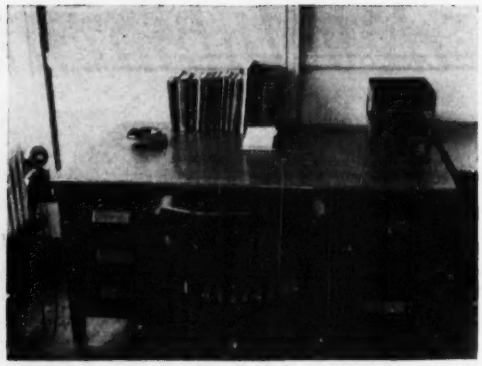
The 24th Exposition of Chemical Industries will be held at Grand Central Palace, New York

NOV. 30 to DEC. 5, 1953

Management International Exposition Company, Grand Central Palace, N. Y.

CHEMICAL INDUSTRIES

9:30: Desk full of work; more in the plant.



5:00: All shipshape; no problems to take home.

How to Get Things Done

The way to accomplish things is to get started and keep plugging until the job is done. But there are a lot of tricks, shortcuts and mental attitudes that help.

Is your desk piled high with "urgent" things to be done—things that should have been done a week or a month ago? If you've ever experienced that "trapped" or "panicky" feeling that comes with getting so far behind in your work that you don't know where to begin digging out from under then you'll enjoy reading Donald and Eleanor Laird's book "The Technique of Getting Things Done."

These two remarkable psychologists have the knack of talking to the people they're trying to help rather than to their fellow psychologists. And they know how to be interesting.

The authors point out, in their book, that success escapes people because of a lack of direction more than for any other single reason. Failure to get ahead doesn't come from a lack of brains or character or willingness but from an inability to get things done.

Some people don't know how to plan their work, others can't make decions quickly, still others simply cannot apply themselves to a task they don't like.

The Lairds have some pretty good ideas on the subject of straightening a zigzag pattern of accomplishment to a straight line of progress.

Material based on and excerpted from "The Technique of Getting Things Done," by Donald A. Laird and Eleanor C. Laird, with permission of the publisher, Whittlesey House, a division of the McGraw-Hill Book Co., New York, N. Y.

Let's look at some brief abstracts from the book.

1. BE DISSATISFIED

The Lairds point out that there's magic in a goal and smart people know it.

Take the question "What were you working for on your last job." Employers ask it of the prospective employee.

Ninety-nine out of a hundred will answer with their last salary.

But the hundredth will name some specific goal—he wanted to learn the business, buy a house or the like.

He's the man to keep an eye on. Chances are that he's the one who'll get things done.

Easy success in early life becomes a handicap when it brings self-satisfaction. That's why many child prodigies become has-beens in their twenties.

Getting what one wants is sometimes worse for later production than not getting it. That's why new crops of self-made men are always coming to the top, why old family businesses pass into new hands.

Without dissatisfaction a man is like a watch without a mainspring. The works are all there, but it takes the spring, struggling to release itself, to make the watch run.

Men and women who go through life without definite goals to strive for are like tired children—they don't know what they want and will not stop whining unless they get it.

2. DETOUR THE DETOURS

The quality called "executive judgment" is largely the ability to concentrate on what counts, to spot detours and keep off them.

Henry Ford put it mildly when he said, "The number of needless tasks that are performed daily by thousands of people is amazing."

They use time and energy on things that don't count.

They make too many telephone calls.

They visit too often and stay too long on each visit.

They write letters that are three times as long as necessary.

They work on little things, neglect big ones.

They read things that neither inform nor inspire them.

They have too much fun too often.

They spend hours with people who cannot stimulate them.

They read every word of advertising circulars.

They pause to explain why they did what they did, when they should be working on the next thing.

They spend so much time searching for errors in other people's work and take so much delight in calling attention to these errors that they seldom have time for any work of their own.

They hurry to the movies when they should be going to night school.

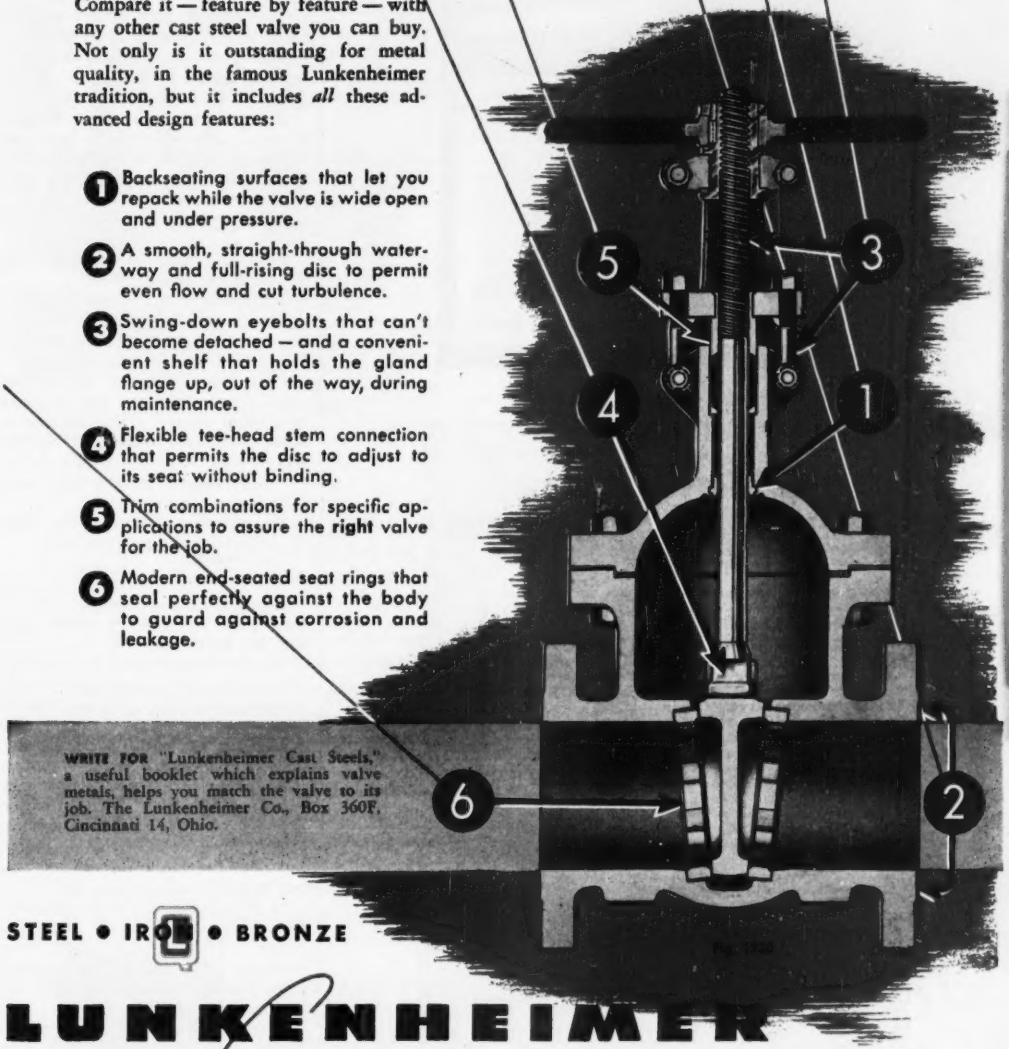
They daydream at work when they should be planning ahead for their job.

They do all sorts of things which are not worth the time they take.

Here's the Only 300 Lb. Steel Valve Which Gives You *All These Features*

Compare it — feature by feature — with any other cast steel valve you can buy. Not only is it outstanding for metal quality, in the famous Lunkenheimer tradition, but it includes *all* these advanced design features:

1. Backseating surfaces that let you repack while the valve is wide open and under pressure.
2. A smooth, straight-through waterway and full-rising disc to permit even flow and cut turbulence.
3. Swing-down eyebolts that can't become detached — and a convenient shelf that holds the gland flange up, out of the way, during maintenance.
4. Flexible tee-head stem connection that permits the disc to adjust to its seat without binding.
5. Trim combinations for specific applications to assure the right valve for the job.
6. Modern end-seated seat rings that seal perfectly against the body to guard against corrosion and leakage.



WRITE FOR "Lunkenheimer Cast Steels," a useful booklet which explains valve metals, helps you match the valve to its job. The Lunkenheimer Co., Box 360F, Cincinnati 14, Ohio.

STEEL • IRON • BRONZE

LUNKENHEIMER

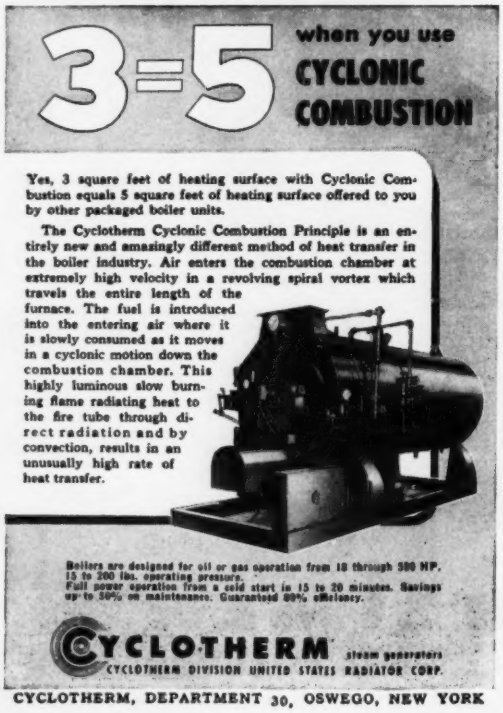
THE ONE *Great* NAME IN VALVES

L-561-2

● It describes and illustrates all models Bin-Dicator bin level indicators for thin or thick walled bins, inside or outside location and suspended interior installation in tanks, silos, hoppers and bins. Also describes Bin-Flo Aerator for keeping pulverized materials moving. Many wiring diagrams. Write for this helpful new catalog.

THE BIN-DICATOR CO.

13946-DI Kercheval • Detroit 15, Mich.


3=5
when you use
CYCLONIC
COMBUSTION
Yes, 3 square feet of heating surface with Cyclonic Combustion equals 5 square feet of heating surface offered to you by other packaged boiler units.
The Cyclotherm Cyclonic Combustion Principle is an entirely new and amazingly different method of heat transfer in the boiler industry. Air enters the combustion chamber at extremely high velocity in a revolving spiral vortex which travels the entire length of the furnace. The fuel is introduced into the entering air where it is slowly consumed as it moves in a cyclonic motion down the combustion chamber. This highly luminous slow burning flame radiating heat to the fire tube through direct radiation and by convection, results in an unusually high rate of heat transfer.
Boilers are designed for oil or gas operation from 10 through 500 HP.
15 to 200 lbs. operating pressure.
Full power operation from a cold start in 15 to 20 minutes. Savings up to 50% on maintenance. Guaranteed 80% efficiency.
CYCLOTHERM
steam generators
CYCLOTHERM DIVISION UNITED STATES RADIATOR CORP.

CYCLOTHERM, DEPARTMENT 30, OSWEGO, NEW YORK

YOU AND YOUR JOB, cont. . .

They are going to beat the band—but in circles.

3. PLAN AHEAD

"Plan your work, then work your plan."

It's generally conceded that planful workers accomplish more than those who are merely diligent workers.

Some people plan by using a small note pad. The instant they get an idea, an order or a request they jot it down as a thing to be done. Then they organize their notes so that one job will logically follow another.

They lose no time wondering what to do next or waiting to be told.

Plan your day "tight." Schedule enough things to keep you on the jump. Don't be easy on yourself.

But be reasonable with yourself, after all. Plan enough to keep you sprinting, but not so much that you will get discouraged or that you can't possibly finish it.

Schedule your outgoing telephone calls in a bunch, all at one sitting. There is less chance of busy lines early in morning or late afternoon.

Plan conferences near the beginning or close of the day, not in the midst of work periods. And write out a list of things to discuss in each conference.

Plan things you can work on or think about while you are in transit or waiting around. Have reading or other constructive work handy for the odd moments that inevitably crop up.

Plan tomorrow, tonight; don't wait for tomorrow morning.

The best way to stop marking time is to start scheduling your time.

4. SAY NO TO YOURSELF

Like apples, some people ripen as they grow older, while others turn soft and rot in spots.

People who get things done have to be tough-minded, have to say no to tempting short-term gains and stick to their long-range goals.

Children are creatures of impulse. They shift from one thing to another like quicksilver. They start many things; finish few. Their attention is distracted by every passing sight or sound. They are always doing things, but since they do not direct and control impulses, get nothing done.

It takes brains to say no. The feebleminded can't control their impulses. They are distracted every moment, get into one predicament after another because they lack the mature brain cells to say no.

On the other hand, geniuses get things done, not only because they get bright ideas, but also because they can discriminate between the bright ideas that are worth following through

Building New Worlds...

Time was when young men sought opportunity beyond the oceans, or on the untamed frontier.

Today, young men of vision and spirit search for new worlds on the frontiers of science. Phillips Petroleum Company offers opportunities for such young men.

Of the more than 20,000 employees of Phillips Petroleum Company, 2,200 are technical graduates. Phillips achievements in the field of petrochemistry have resulted from effective research and development by these scientists and engineers. That Phillips today is engaged in the manufacture of such diversified products as carbon black, butadiene, anhydrous ammonia, synthetic rubber, sulfur compounds, nitrogen fertilizers, cyclohexane, diisopropyl, isooctane, elemental sulfur, and vinylpyridines (in addition to our main business of conventional fuels and lubricants) is evidence of the scope, intensity and success of the company's scientific and engineering activities. The receipt in 1951 by Phillips of the Chemical Engineering Achievement Award resulted from the constructive teamwork of these scientists and engineers.

In its laboratories, pilot plants and commercial plants, Phillips offers to qualified young scientists and technologists an opportunity to build a better future with the petroleum and petrochemical industries.

Phillips 66

PHILLIPS PETROLEUM COMPANY

Phillips Chemical Company, A Subsidiary

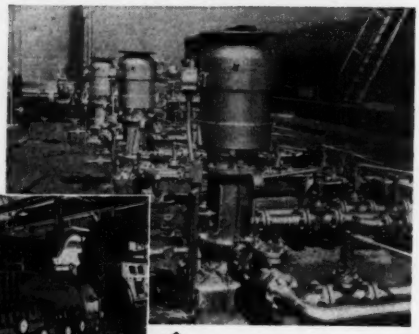
Bartlesville, Oklahoma

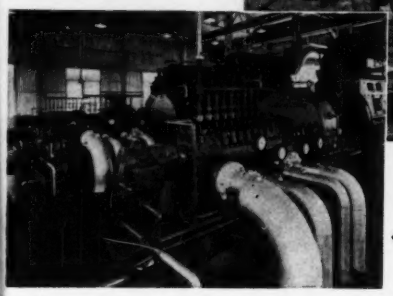
When your need is the economical transfer of liquids from one location to another . . .

Specify **PUMPS REFINED FOR YOUR SPECIFIC SERVICE**

BY Pacific

You will not see all the refinements—some are hidden—But you will see all the economies effected by Pacific's refinements.





Vertical Pumps Refined for A Special Service by Pacific

Horizontal Pumps Refined for A Specific Service by Pacific

You will not see:

★ the balanced proportions of the heavy sections or the quality of the selected materials of construction that insure extra strength with extra allowance for corrosion.

★ the dynamic or the hydraulic balance that eliminates vibration. the precision workmanship and finish that insure perfect fit for all parts.

You will see:

★ curves outlining liquid passages formed and proportioned for high efficiency streamlined flow without turbulence, destructive caviatation or erosion.

★ **IN YOUR MONTHLY STATEMENTS AN OUTSTANDING RECORD OF AVAILABILITY—RELIABILITY—LOW COST FOR OPERATION AND MAINTENANCE.**

PACIFIC *Precision Built* **PUMPS**

Pacific Pumps inc.

ONE OF THE DRESSER INDUSTRIES

HUNTINGTON PARK, CALIFORNIA

Export Office: Chanin Bldg., 122 E. 42nd St., New York

Offices in All Principal Cities

PP-15

and the bright ideas that had better be dropped. The man of genius finds it relatively easy to say no; if he doesn't, he is merely brilliant but erratic.

Everyone knows that the brain is composed of several layers of nerve cells. Man's innermost layers are not much different from those of four-footed animals. His outer layers are much more highly developed. These outer layers are the brain-cortex.

The chief purpose of the cortex of the brain is to coordinate impulses, to say no to most impulses while giving priority to a few. The cortex functions, not to generate bright ideas, but to inhibit random, useless, and unproductive actions. To inhibit means to say no.

So, when somebody tells you to use your head, what he means is for you to say no.

5. DO FIRST WHAT YOU DISLIKE MOST

The doer likes his work because he has no unpleasant jobs hanging fire. He has already cleaned them up. He does not dread the next task, for the unpleasant job is behind him.

Putterers are usually putting off doing something unpleasant. They putter over easy, little things, trying to keep busy so they have a pseudo excuse for not doing the job that worries them.

Frank Phillips was no putterer. He was born in a Nebraska log cabin. He ran a small-town barber shop in Iowa and made a fortune half again as big as Vanderbilt's.

At fourteen Phillips decided to be a barber because he wanted to wear striped trousers. At thirty he was drilling for oil in Oklahoma and not wearing striped trousers. He drilled his first two wells in proved, producing oil fields, but the wells brought in nothing but dust.

His third well was started in a location experts did not think worth testing, and they laughed at the barber turned oilman. But he brought in a gusher this time.

He drilled other wells, became a large oil producer. Then Phillips decided he would like to sell oil direct to the motorists.

By now, he knew a great deal about producing petroleum products. But selling them retail was something else again. Phillips had seen from experience that the way to learn a job was to tackle the hardest part of it first. So he had some men locate the worst place in the country in which to try to sell gasoline. They picked Wichita, Kansas, and it was here he started.

In a few years he had built a 681-

mile gasoline pipeline, the first in the country for gasoline, to connect his refineries with his enormous chain of filling stations. Engineers advised against a gasoline pipeline, said it would be impossible to prevent evaporation through the joints. But Phillips by this time knew how to get any mean job done, and the joints were securely welded.

"The king of the independents," oil men call Frank Phillips. Tackling the difficult part of each job first enabled him to get things done and earned him that title.

Men who say their jobs have too many headaches are usually confessing they put off the unpleasant things while they putter around at others.

6. DECIDE TRIFLES QUICKLY

The way in which people make up their minds separate them into four classes.

1. The die-hard conservatives, who take a long time to think over trifles and end up by deciding to do nothing at all.

2. The conservatives, who waste their energy on trifles but usually do something in the long run.

3. The progressives, who reach decisions quickly, go into action quickly, and may change their minds quickly.

4. The radicals, who reach decisions quickly but, instead of going into action, spend their energies trying to justify these decisions and who are inclined to hold to their decisions so long that in time they almost qualify as members of the first class.

The people who get things done rarely belong to either of the extreme classes. The achievers come from the second or third class.

Decide quickly and you will probably make a better decision.

7. GET A VIGORONS START

Energetic starters need not worry about getting things done, falling in ruts or lacking opportunities.

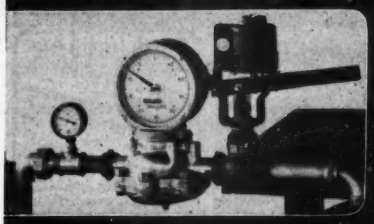
Initial intertia is a law of all life, both animate and inanimate. It's like pushing a stalled automobile. It may take two or three people to get the car moving, but once it rolls one man can usually keep it moving with one hand.

Get going vigorously first thing in the morning and the rest of the day will take care of itself. Start off with a bang.

Each new day, like each new task, requires an initial push to get it going. The vigorous pushers accomplish things. The slow pushers have more things left over to do tomorrow—or next week.

Do your coasting afternoons. Put forth all your horsepower mornings, right from the first upward slope. Dress vigorously, put some enthusiasm

GREATER ACCURACY FOR YOUR BATCH MEASUREMENT OF LIQUIDS



NIAGARA
Electricontact
METERS

Here's an efficient meter that offers simple, accurate, fast measurement of all commercial liquids – AUTOMATICALLY. A precise electri-contact unit stops flow of liquid through pipe; shuts off pump motors; provides visual or audible signals to the operator. Electric control imposes no friction load on the meter, insures greater accuracy, longer life.

Get the facts on meters to meet your requirements – today

BUFFALO METER CO.

2893 MAIN STREET

BUFFALO, N. Y.

Please send me full information on use of Niagara Electri-Contact Meter for:

Liquid.....

Temp.....°F. Pressure.....p.s.i.

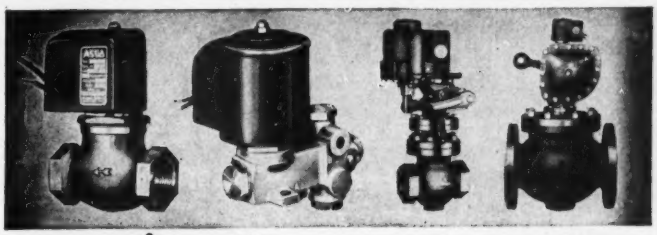
Flow rate.....g.p.m.

Maximum Batch.....gals.

Company.....

By.....

Address.....



Ideal *Automatic* Control for Liquid or Gas Flow!

You can't beat the solenoid operated valve for many conditions where the flow of a liquid or gas must be *automatically* controlled. And the meaning of "controlled" covers quite a range of services. For example, in the line of ASCO Solenoid Valves you can get automatic control through the following, each functioning differently.

- *Safety Shut-off and Trip Valves*
- *Shut-off Valves—Packed Type*
- *Shut-off Valves—Packless Type*
- *3-Way Pilot Valves*
- *2-Way & 3-Way Pilot Controlled Valves*
- *4-Way Pilot Valves*

Everyone of these valves functions automatically either in an emergency or in timed cycles, depending upon the design and application. Some reset manually; others, electrically. They are designed for use on pipe lines conveying liquids or gases or on processing machinery which must be protected by an automatic flow control or which requires automatic timing of the flow in its operation. We suggest that if some type of automatic control of liquid or gas flow is required in your plant, you investigate ASCO Solenoid Valves. They are constructed to meet many corrosive conditions and many have explosion proof and water-proof solenoids. Many, too, are of the design approved by Factory Mutuals and Underwriters' Laboratories.

In writing, for literature, tell us in detail about your requirements. V. 5011

When in need of Automatic Transfer Switches, Remote Control Switches, Contactors, Relays, and Specialized Electromagnetic Controls, come to us.

ASCO Solenoid VALVES

Automatic Switch Co.

381 LAKESIDE AVENUE • ORANGE, NEW JERSEY

Send us a sample of any stock you want to
PULVERIZE

You will receive an Engineering Report based on our Test Grind with the
SCHUTZ-O'NEILL PULVERIZER

Do you have a production problem on stocks you grind, to get desired uniformity or fineness? Are you looking for increased output with a cost reducing method? Profit by Schutz-O'Neill's experience of almost 60 years in the rapid, dustless, accurate pulverizing of any dry, non-gritty, grindable stock. Your acceptance of this offer for a test grind does not obligate you. Schutz-O'Neill Pulverizers are made in 6 sizes with capacities up to 3000 lbs. per hour.

Catch tramp iron or steel with a Schutz-O'Neill SUPER-MAGNET
Standard equipment on feeders for Schutz-O'Neill Pulverizers.

The finest development of Centrifugal air-force pulverizing

For extremely fine grinding and uniformity of product, the principle of centrifugal impact with product carried by the air stream, has never been surpassed. Schutz-O'Neill Pulverizers utilize this principle to the fullest degree.

The Schutz-O'Neill Gyrator Sifter turns out a large volume of uniform, sharp products. 2 to 3 sieve frames for single or multiple separation.

Send us stock sample
State fineness desired

You will receive your pulverized stock plus our Engineering Report giving recommended equipment, methods and mill plans. Literature upon request.

ESTABLISHED 1893 SCHUTZ-O'NEILL CO.
301 Portland Ave., Minneapolis 15, Minnesota

AUTOCLAVE
SPECIALIZED DESIGN
30,000 P.S.I. COMBINATION VALVE

with openings for blow out assembly, gage, gas inlet and outlet.

This is a typical application of Autoclave's skill and capacity to a requirement in a specialized field.

For information about these new developments ask to have your name on our mailing list.

WRITE TODAY

AUTOCLAVE ENGINEERS, INC.
860 EAST 19th STREET • ERIE, PENNSYLVANIA
LABORATORY & PILOT PLANT HIGH PRESSURE EQUIPMENT
EXPORT DEPT 751 • DREXEL BLDG • PHILADELPHIA 5, PA.

into your breakfast, dig into the work with all your might.

Weak starts make deep ruts. Energetic starts pull people out of ruts.

8. GET AN EARLY START

There's an old adage "Get up early three mornings and gain one day of time." This phrase is more than true.

It's a well-known fact that bodily efficiency rises and falls and most people are at their peak early in the morning. For most persons this peak occurs at 8 o'clock in the morning; the low points around 4 o'clock in the afternoon and 10 in the evening.

Among self-made men and women, a very large number of the really successful ones have been early morning workers.

9. GET OTHERS TO HELP YOU

Everyone recalls the story of how Tom Sawyer whitwashed the fence. He pretended to be having so much fun that his playmates actually paid to whitewash it for him. The story is more than an entertaining yarn. Tom Sawyer's successful way of getting others to do his job works in real life. And it works with adults as well as children.

Only little men want to do everything themselves.

Big men get someone else to help them.

"The training of men is the chief job of any executive," said Cyrus McCormick.

And the best way to train men is to have them help you at your own work.

The opportunity to do more important things usually goes to that individual who has had others help him and thereby trained them to do his work.

Get others to help you and give them more credit that they deserve for their assistance. You may discover they have unusual talent, and the credit you give them will earn you friendship and loyalty.

These are just a portion of the good hints for production that the Lairds put forth in their book. Some of the other ideas suggested for getting things done:

- Work for more than money.
- Take on more work.
- Make good work habits become a habit.
- Don't accept your alibis.

In some 300 pages, the authors have taken the success secrets from more than 300 dynamic leaders and reduced these to common denominators that the reader can apply to his own mode of living.

It's good reading.

PURE WATER in your plant...

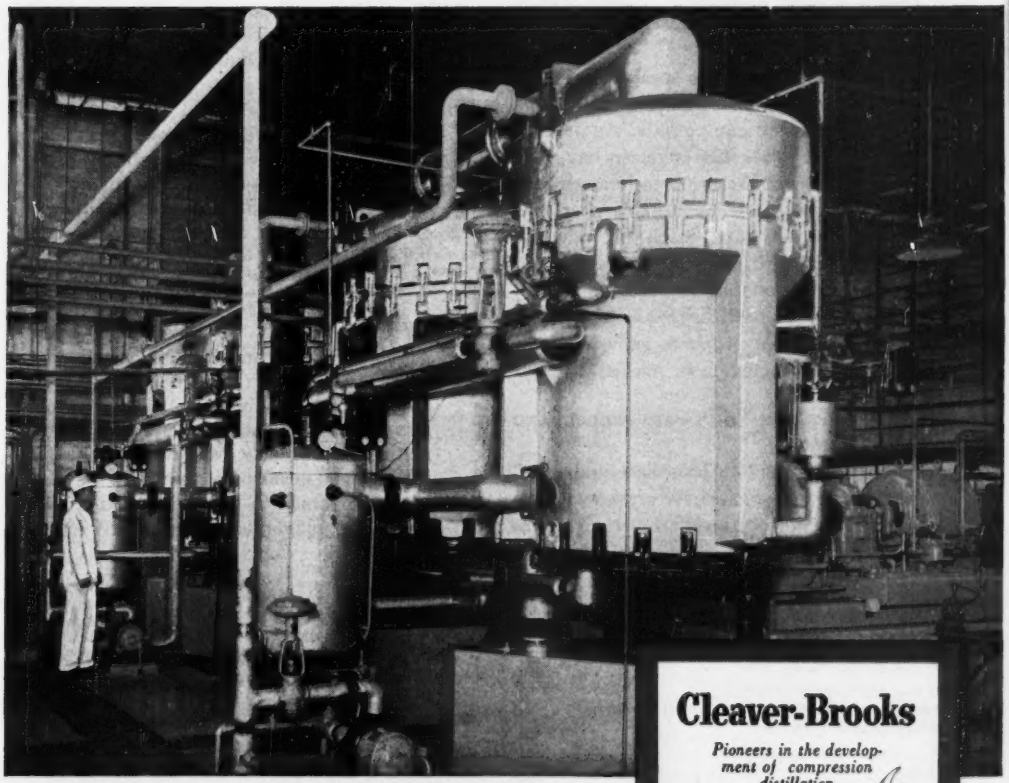
a reliable source of DISTILLED WATER OF LABORATORY QUALITY at lowest cost with CLEAVER-BROOKS compression stills

IF your process requires a supply of chemically pure water, the most reliable and economical way of providing it is to have your own source, independent of pipe lines, trucking or barging facilities.

From any water available, a Cleaver-Brooks Compression Still will give you USP chemically pure, pyrogen-free water . . . of quality far exceeding the high standards needed for chemical processing or pharmaceutical preparations.

Cleaver-Brooks Compression Stills are available in standard sizes to meet your requirements . . . from 85 gph to 2800 gph . . . motor, engine or turbine driven.

Write for latest bulletin "Compression Distillation," Cleaver-Brooks Company, Dept. H, 250 No. Grand Ave., Waukesha, Wis.



Cleaver-Brooks

Pioneers in the development of compression distillation

Cleaver-Brooks Compression Stills at Arrowhead & Puritas Waters, Inc., Los Angeles, Cal. This plant is one of the largest compression still installations in the world, producing over 100,000 gals. of pure water daily.

Builders of Equipment for the Generation and Utilization of Heat • Steam Boilers • Oil and Bitumen Tank-Car Heaters • Distillation Equipment • Oil- and Gas-Fired Conversion Burners

(Scanning time 1 minute, 45 seconds)

NEW PHOSPHATES DOING THINGS FOR INDUSTRY

New phosphate compounds and their versatile properties are being uncovered frequently in Victor's research laboratories. Industry is finding profitable uses for the growing family of phosphate compounds like those on the opposite page. Study the newer phosphates and the chances are you'll find one that does a job you want done . . . and does it better at lower cost.

For 54 years Victor has specialized in the manufacture and development of phosphates and phosphorus compounds. Again and again, Victor production engineers have perfected new manufacturing techniques that have brought these remarkable chemicals within the economic reach of industry. Today, the facilities of Victor's 7 plants and its research assistance to industry are unmatched in this field. Large *and* small users of phosphates have come to know Victor as *the* dependable name in chemicals.

VICTOR POLYPHOSPHATES SOLVE MANY PRODUCT AND PROCESS PROBLEMS

Victor sodium tripolyphosphate and tetrasodium pyrophosphate have proved valuable to many manufacturers. Formulators of synthetic detergents, soap products, and cleaners have found that these two Victor compounds are the most effective builders for their products.

POWERFUL PEPTIZERS

Victor polyphosphates give these advantages: They are powerful peptizing and dispersion agents, and prevent the redeposition of soil. They display excellent water softening ability, and are efficient repressing agents of calcium and magnesium. Both are rapidly soluble, yet non-deliquescent.

EFFICIENT DISPERSANTS

The unique properties of these two Victor polyphosphates have made them useful as water softeners, as dispersants for special clays, in textile processing, as conditioners of oil drilling muds, as builders of soaps and industrial cleaners, for de-inking newspaper, and others.

PROBLEMS SOLICITED

After reading the important information on the next page, you may find that Victor polyphosphates offer possibilities to you. Experimental samples and additional information are available. Mail the coupon. Our research and development staff will welcome the opportunity to work with you. Please attach the coupon to your company letterhead.

VICTOR CHEMICAL WORKS
141 W. Jackson Blvd., Chicago 4, Ill.
Please send without cost or obligation:
☐ Sample of Sodium Tripolyphosphate ☐ Sample of Tetrasodium Pyrophosphate
☐ Additional Information ☐ File Folder
NAME_____ TITLE_____
COMPANY_____
STREET_____
CITY_____ ZONE____ STATE_____
(Fill in and attach to company letterhead)

INFORMATION ON VICTOR POLYPHOSPHATES AVAILABLE IN HANDY FILE FORM

The information given here and additional data on Victor sodium tripolyphosphate and tetrasodium pyrophosphate have been consolidated for your convenience into a handy, 8½ x 11 file folder. Be sure you get your copy. Fill in and mail the coupon.

UNIQUE PROPERTIES OF

VICTOR POLYPHOSPHATES

	SODIUM TRIPOLYPHOSPHATE	TETRASODIUM PYROPHOSPHATE
Chemical Formula	$Na_5P_3O_{10}$ (Anhyd.)	$Na_4P_2O_7$ (Anhyd.)
Typical Analysis	Phosphorus Pentoxide (P_2O_5) ..... 57.5% Sulfates (SO_3) ..... .07% Fluorine (F) ..... 5 ppm* Arsenic (As_2O_3) ..... 0.1 ppm* Lead (Pb) ..... 0.4 ppm*	Phosphorus Pentoxide (P_2O_5) ..... 53.1% Sulfates (SO_3) ..... .07% Fluorine (F) ..... 5 ppm* Arsenic (As_2O_3) ..... 0.1 ppm* Lead (Pb) ..... 0.4 ppm* *Parts per million
Types Available	Powdered and Granular	Powdered and Granular
pH—1% Sol.	9.7	10.2
Solubility in 100 Parts of Water	25°C.—14.5 pts. 80°C.—23.25 pts. 40°C.—16.25 pts. 100°C.—32.5 pts. 60°C.—19.25 pts.	25°C.— 6.0 pts. 80°C.—41.1 pts. 50°C.—16.5 pts. 95°C.—29.0 pts. 75°C.—46.0 pts.
Water Softening Efficiency—percentage of phosphate on weight of water required to secure zero hardness toward soap. Test waters contained 2 to 1 ratio of calcium to magnesium hardness.	Hardness PPM / Room Temp. / 140° F. / 180° F. 50 / 0.05% / 0.05% / 0.05% 100 / 0.11 / 0.11 / 0.09 200 / 0.20 / 0.18 / 0.15 300 / 0.30 / 0.27 / 0.21 400 / 0.39 / 0.33 / 0.27 500 / 0.50 / 0.48 / 0.33 Sodium Tripolyphosphate solubilizes both calcium and magnesium soaps.	Hardness PPM / Room Temp. / 140° F. / 180° F. 50 / 0.21% / 0.21% / 0.21% 100 / 0.38 / 0.30 / 0.26 200 / 0.56 / 0.45 / 0.38 300 / 0.66 / 0.55 / 0.54 400 / 0.75 / 0.69 / 0.69 500 / 0.88 / 0.75 / 0.75 Tetrasodium Pyrophosphate solubilizes magnesium soaps and disperses calcium soaps.
Stability to Reversion in Hot Water Solutions. (Both products are stable for months in solution at room temperature.)	After 10 hours at 160°F. solution will contain approximately 98% STPP (unchanged), 1.2% pyrophosphate, and 0.8% orthophosphate. After 2 hours at 212°F. (boiling) solution will contain approximately 80% STPP, 12% pyrophosphate, and 8% orthophosphate.	After 10 hours at 160°F.—practically no hydrolysis—solution still contains approximately 100% of original concentration of TSPP. After 2 hours boiling—99% TSPP, 1% orthophosphate. After 20 hours boiling—90% TSPP, 10% orthophosphate.
Peptizing and Dispersing of Solid Particles.	Both products are very effective, the choice depending on nature of solid particles to be dispersed.	
Uses	Water softening. Builder for detergents and soaps—including bar and chip soap (non-blooming). Industrial cleaners. Dispersant for pitch control in paper manufacture. Clay dispersing. Textile processing. Conditioning drilling muds.	Water softening. Builder for soaps and detergents. Conditioning drilling muds. Industrial cleaners subjected to high temperatures for long periods. Stabilizing peroxide bleach baths. Clay dispersing. Textile processing. De-inking newsprint. Tin plating.

VERSATILE

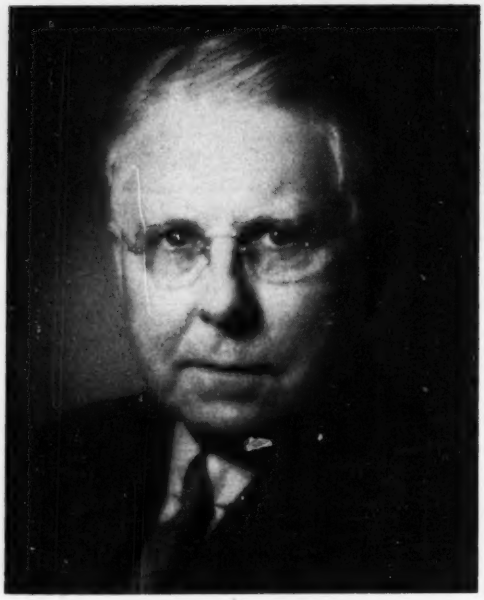
VICTOR CHEMICALS

VICTOR CHEMICAL WORKS
141 W. Jackson Blvd., Chicago 4, Illinois
In the West: A. R. Maas Division,
4570 Ardine St., South Gate, Calif.

SALES OFFICES:
Kansas City, Mo. • Nashville, Tenn.
New York, N. Y. • South Gate, Calif.

PLANTS:
Chicago Heights, Ill. • Mt. Pleasant, Tenn.
Morrisville, Pa. • Nashville, Tenn. • Silver Bow, Mont.
South Gate, Calif. • Victor, Fla.

Names in the News Edited by Frances Arne



MAN OF THE MONTH: J. H. Mathews

Retiring chairman of the University of Wisconsin's department of chemistry, is one of the founders of Alpha Chi Sigma.

When you have pioneered in the field of scientific crime detection, when you have built one of the major chemistry departments in the nation, and when you have taught generations of students and contributed major ideas in your field—what do you recall as a high point on retirement from all of this?

Prof. J. H. Mathews, chairman of the University of Wisconsin department of chemistry, now in his 70th year, retires this month. Just 50 years ago he and seven fellow-students at the University of Wisconsin decided to start a professional chemistry fraternity. The July retirement of Prof. Mathews will coincide with the golden anniversary of that fraternity, Alpha Chi Sigma, which now has chapters from coast to coast.

Since 1919, as professor and director of the course in chemistry and as pioneer in the application of scientific techniques in criminal investigations in Wisconsin and elsewhere, he has engaged in both chemical and criminological problems.

In administering the department of chemistry, Mathews has proved to be efficient in day-to-day affairs and a sound planner for the future. In this era of increasing specialization in science, when government and private laboratories are competing for first-class personnel, it becomes ever more important that a university do likewise. Under Mathews' guidance, the chemistry department at the UW has developed into one of the best in the country.

"The technique of attracting and holding good men," he says, "involves getting a few good men as a nucleus and providing them with teaching and research opportunity and adequate pay. If that can be done, a fine staff can eventually be built up such as the one we have now."

Mathews' reputation as a chemist is equalled by his work in crime detecting.

His connection with criminal investigations began soon after Christmas, 1922. A homemade bomb had exploded, injuring a Wood County farmer, and killing his wife. Mathews' work led to the arrest and conviction of a neighbor.

"This case involved a metallographic examination of bomb fragments and comparisons of them with certain metals from the suspect's farm shop," he recalls.

"We were able to prove that those bomb fragments were cut from pieces found in his shop. The affair finally went to the State Supreme Court, where the verdict of guilty was sustained, and Prof Fahlberg, my colleague, and I were highly praised for our work."

Mathews has helped to solve hundreds of other crimes. He uses a polygraph, the lie detector, microscopic analysis of metals, comparison of rifling marks on bullets, examination of documents, and many other special techniques.

Because of this experience, he came to advocate the need of a crime laboratory in the state of Wisconsin so that police officers could be trained in scientific methods. In 1948 such a laboratory was established. He maintains close contact with police and other agencies and has been a member of the Madison Police and Fire Commission for 15 years.

It isn't often that a chemist lectures to sociology students, but Prof. Mathews has done so for more than 10 years, talking to them about "the identification of the criminal by scientific methods."

Prof. Mathews intends to enjoy his new leisure constructively. Next door to his office is a laboratory containing all sorts of gadgets to help trap criminals. He'll spend at least half his time working there.

He has other plans too. He will undertake an intensive study of the rifling characteristics of more than 200 guns in his collection, as well as hundreds of other guns sent to him for study. And for the benefit of other experts, he wants to publish the results of this work.

J. L. K. Snyder. New York consultant in the chemical, pharmaceutical and nutrition fields. Formerly, vice president in charge of sales for Merck and Co.

Ralph A. Morgan. Staff member of the division of mathematical, physical and engineering sciences, National Science Foundation. Formerly director of the engineering and industrial experiment station of the University of Florida. Prior to 1938, consulting chemical engineer to various government and private research and development agencies. Doctorate from the University of California.

Joseph W. Lang. Director of research, central research laboratory, General Aniline & Film Corp. Formerly manager of the company's Rensselaer, N. Y., plant. With the company since 1943. Before that, with Du Pont in research and chemical engineering work in the organic chemicals department. Doctorate

They've just got to match!

The twins won't have to worry. The colors of their brand new birthday dresses match *right on the button!* For the American dye industry licked the basic problems of color uniformity long before they were born.

Precise color matching is just one of the demands that must be met by the nation's dye manufacturers. The rainbow of dyestuffs they produce must be fast to light, laundering and wear. They must apply easily and uniformly to the modern synthetic fiber like nylon, as well as cotton, wool, linen and silk. Indeed, few other products in the world demand such a high degree of *quality control* in their manufacture.

This was one of the many factors we had in mind when we recently formed our Fine Chemicals Division for manufacturing dyestuffs. As a basic producer of coal chemicals, including the important intermediates from which a great many dyes are made, we're in a position to closely control and maintain the high quality and purity of Pittsburgh Dyestuffs from coal to the finished colors.

This unique basic position—which offers definite advantages to buyers of Pittsburgh agricultural chemicals, plasticizers, protective coatings, and the products of our other integrated divisions—will soon be helping the nation's textile industry to produce tomorrow's brighter and better materials.

The Pittsburgh Coke & Chemical Co.

is a basic producer of

COAL CHEMICALS PROTECTIVE COATINGS

AGRICULTURAL CHEMICALS

PLASTICIZERS ACTIVATED CARBONS

COKE CEMENT PIG IRON

WBD 4233

P C&C C

PITTSBURGH
COKE & CHEMICAL CO.

Want Vinyl Coating PROTECTION? . . . Plus SIMPLE APPLICATION?

Revolutionary Prufcoat Primer P-50 Makes it Possible to Use Vinyl Coatings Just Like Ordinary Paints

If you want the superior chemical resistance of vinyl base paints, yet shy away from the special application techniques such coatings formerly required, there's real news for you in Prufcoat Primer P-50.

With this amazing new inhibitive primer, you now can use vinyl coatings just like ordinary paints: (1) Prepare the surface by simple routine methods such as wire-brushing; (2) Apply heavy-bodied Prufcoat Primer P-50 by brush or spray, just as you would red lead; (3) Then make your vinyl top coat application in a matter of hours.

On old or new metal, this quick, easy "Prime and Paint" procedure eliminates all danger of underfilm failures as well as providing positive primer-to-surface and vinyl-to-primer adhesion. It's a revolutionary, simpler vinyl system that licks the toughest corrosion problems, while slashing hours off labor time . . . dollars off painting costs.

But that's only part of the story. Prufcoat Primer P-50 fills the same need for controlling underfilm corrosion and assuring positive top coat adhesion, whether a heavy-duty vinyl coating or a conventional paint finish is to be applied . . . a unique "one-primer-for-all-finishes" advantage that means important additional savings.

Yes, Prufcoat Primer P-50 can save time, trouble *and* money . . . *throughout* your plant . . . as well as in your most difficult corrosion areas. For the full story, send for Prufcoat Technical Bulletin No. 015. Or better still, get a trial quantity of Primer P-50 along with some "A" Series Prufcoat vinyl coating and *see for yourself* under your own plant conditions. Act today!

MAINTENANCE ENGINEERS!
Check These Primer P-50 Features

- V The first completely practical primer for vinyl coatings.
- V Only routine surface preparation is needed.
- V Applies like ordinary paint and dries fast.
- V Positive adhesion to old or new metal is assured.
- V Under-film corrosion and rust creepage are controlled.

PRUFCOAT LABORATORIES, INC.
50 East 42nd Street, New York 17, N. Y.

To Save Time, Trouble *and* Money
Just "PRIME and PAINT" with PRUFCOAT

NAMES IN THE NEWS, *cont.* . . .

from Columbia. New plant manager at Rensselaer: **David B. Andrews,** formerly manager of process development. Started with GAF in 1937 as a research chemist. Doctorate from the University of Michigan.

Edward M. James. President, American Oil Chemists Society. Assistant to the technical advisor of Lever Brothers Co.

E. M. James

A. M. McAfee

A. M. McAfee. Retiring from his post as chemical engineer with Gulf Oil Corp. which he has held since 1913. Discovered the action of aluminum chloride on petroleum hydrocarbons and subsequently perfected the Alchlor process for petroleum refining. Began manufacture of aluminum chloride from bauxite on a large scale. Member of the University of Texas development board since 1948; chairman of the board of regents, Lamar State College. Studied at the University of Texas and Columbia.

Raymond C. Platow. Chief materials engineer, United States Plywood Corp. Formerly on the technical staff of Bell Telephone Laboratories doing research in the field of plastics, adhesives, sandwich constructions and laminates. NYU graduate.

Henry B. Hass. President, Sugar Research Foundation, Inc., and Sugar Information, Inc. Has been director of research for General Aniline and Film Corp. which he joined in 1949. Before that, head of the department of chemistry at Purdue.

Thomas D. Cartledge. President, Linde Air Products Co. Has been the company's senior vice president as well as a director and vice president of Dominion Oxygen Co., Ltd., a Union Carbide subsidiary. With the company since World War I.

J. C. Pullman. New member of American Cyanamid's new product de-

velopment department. Previously at the company's Stamford research laboratories where he was engaged in the development of chemicals for use in the paper converting industry. Doctorate from McGill University.

Raymond P. Rossman. Executive assistant to the vice president and general sales manager, Godfrey L. Cabot, Inc., Boston, Mass. Has been technical liaison representative between customers and the company carbon black manufacturing operations of the Southwest. Came to the company in 1937. MIT graduate.

D. H. McCondichie. Plant engineer at the new Flint River plant of Merck & Co. Joined the organization in 1951 as a chemical engineer. Chemical engineering graduate of the University of Alabama.

Mary T. Burgess. Chemist, Dewey and Almy Chemical Co., Cambridge, Mass. Formerly a research assistant at MIT. Graduate of Simmons College.

R. H. Boundy

C. B. Branch

R. H. Boundy. Head of research activities, Dow Chemical Co. Since 1945, manager of the company's plastics department. Came to Dow as a chemical engineer in 1926. Assistant director of physical research, 1930 to 1941; assistant to the president, 1941 to 1945. **C. B. Branch:** From manager of the company's technical service and development department to manager of the plastics department. Joined the company in 1937.

Michael Szwarc. Professor of physical and polymer chemistry at the State University of New York College of Forestry at Syracuse. Formerly of the University of Manchester, England.

W. D. Morrison. Assistant manager, product development department, chemical division, Celanese Corp. of America. New director of the company's application laboratory at Newark, N. J.: **D. D. Hecht.**

Standardaire

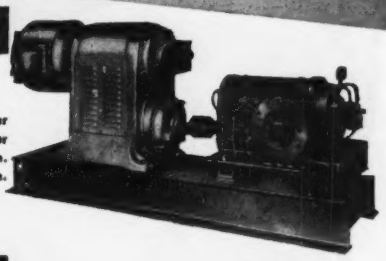
AXIAL FLOW POSITIVE PRESSURE

BLOWERS

provide air to the specific needs of many important industries because Standardaire Blowers are unique in design and construction—unequalled in quality and performance.

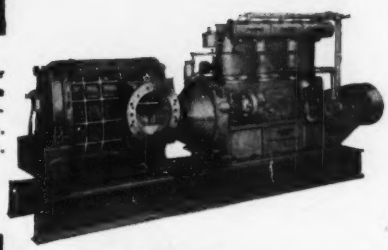
for CHEMICAL PROCESSING

Standardaire Blower with Varidrive Motor to deliver 780 c. f. m. at 1750 r. p. m.



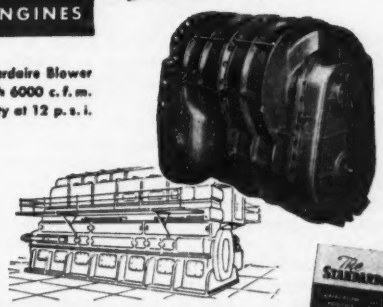
for SEWAGE PLANTS

Standardaire Blower with Climax Engine using sewage gas—to deliver 2100 c. f. m. at 720 r. p. m.



for DIESEL ENGINES

Standardaire Blower with 6000 c. f. m. capacity at 12 p. s. i.



AXIAL FLOW STANDARDAIRE BLOWER

Write DEPT. F4 for Publication No. 90

BLOWER-STOKER DIVISION

READ STANDARD CORPORATION

270 LEXINGTON AVE., NEW YORK 17, N. Y.

GIVES YOU BEST
Performance
Because it's Best
Suited to the Job

WELDCO
Always
Meets Your
Specifications

TO GET TOP-QUALITY TUBING made to your individual needs, it's always good business to specify Weldco. For Weldco is produced by tubing specialists—men who have the equipment, facilities and experience to manufacture tubing to your exact specifications. Weldco is automatically machine-welded under pressure, properly formed, carefully finished, accurately sized and straightened, and rigidly checked.
Lightweight and corrosion-resistant, Weldco is available in Monel, Stainless, Inconel, Nickel and other alloys, in sizes from 3½" to 30" O. D., 16 ga. to ¼" wall thickness. To insure top performance and long service life, make Youngstown Welding your tubing headquarters. A letter or phone call puts our 36 years of specialized experience to work for you.

Whatever Your Needs In Tubing... You're Way Ahead With WELDCO

THE YOUNGSTOWN WELDING & ENGINEERING CO.
3712 OAKWOOD AVE. · YOUNGSTOWN 9, OHIO

NAMES IN THE NEWS, *cont.* . .

F. E. Condo, D. W. Elam, C. H. Klute, T. F. Mika and E. C. Shokal. Supervisors of research, Shell Development Co., Emeryville, Calif. New supervisors of development: W. B. Milligan, C. J. Penther, V. N. Smith and R. S. Treseder.

E. L. Oliver, Jr. Executive vice president, Oliver United Filters Inc. Previously, vice president-manager With the company 19 years.

E. L. Oliver, Jr.

P. G. Stevens

Philip G. Stevens. Chemical consultant to be located at Old Greenwich, Conn. To specialize in commercial chemical development and market research. For the past seven years, with the development department of General Aniline & Film Corp. Prior to this, with Du Pont. Taught organic chemistry Yale and McGill.

Dewey I. Dykstra. Chemical engineer in the engineering branch, research and development division, office of the chief chemical officer, Department of the Army, Gravelly Point, Washington, D. C. Formerly, process engineering supervisor at the Adams Terminal plant of the Phillips Chemical Co. at Pasadena, Tex.

Charles E. Bichenall. Associate professor in the department of chemistry at Princeton. Since 1951, at work on a contract on crystal growth sponsored by the Air Force Cambridge Research Laboratories at Carnegie Institute of Technology. In 1946 he became a research assistant in the Metals Research Laboratory of the institute and since then he has taught courses there in physical metallurgy and conducted and supervised student research in this field. Studied at Temple University and Princeton.

Ralph E. Merryman. From superintendent of chemical production to general superintendent Chattanooga division of Tennessee Products & Chemical Corp. New superintendent of the company's Rockwood

Consigned to motor museum in 1945

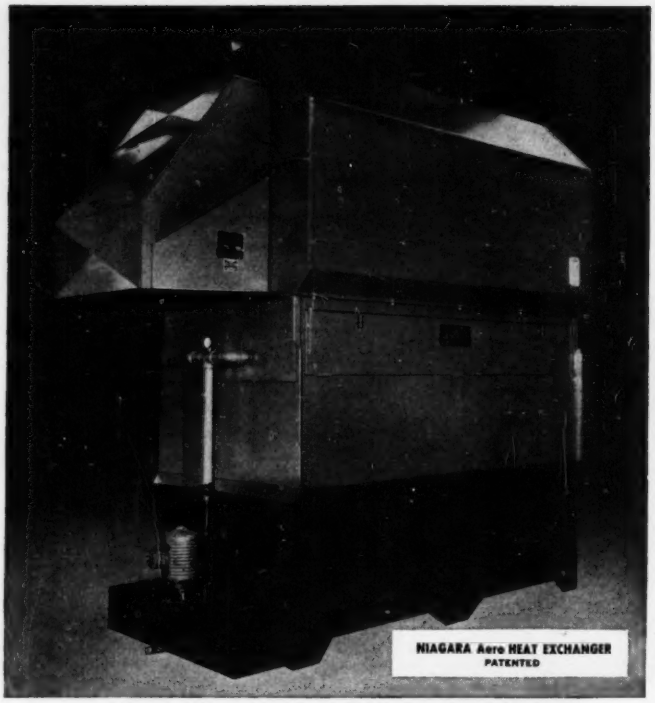
The way to grease a modern motor is DON'T

Life-Lines are pre-lubricated . . . need no further lubrication. Write for "Facts on Pre-lubricated Bearings" B-4378. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-21695

WHAT *Life-Lines* REALLY DELIVER IS MORE SERVICE...LESS SERVICING

YOU CAN BE SURE...IF IT'S
Westinghouse
Life-Line
MOTORS and CONTROLS



SAVE COOLING WATER

Get Many Other Benefits and Cost Savings

• Niagara Aero Heat Exchangers provide faster and more accurate cooling to specified temperatures for liquids in many industrial processes. They help lower production costs.

Cooling by the evaporative principle, they transfer heat to air, which is easily disposed of, and consume less than 5% of water used in conventional cooling methods. A Niagara Aero Heat Exchanger replaces both shell-and-tube cooler and cooling tower, and saves piping and pumping. Its savings quickly return its cost.

It helps improve the quality of production by removing heat at the rate of in-put, and by greater accuracy of control. For example, as applied to heat-treat quenching or to a chemical process cooling, provision for heating as well as cooling saves the time and prevents the product losses of a "warm-up" period.

Successful applications also include control of temperatures for jacket coolants for engines, hydraulic equipment, transformers and electronic sets, and special industrial equipment.

Write for Bulletin No. 120

NIAGARA BLOWER COMPANY

Over 35 Years of Service in Industrial Air Engineering

Dept. CE, 405 Lexington Ave., New York 17, N. Y.

Experienced District Engineers in Principal Cities of United States and Canada

INDUSTRIAL COOLING HEATING • DRYING

NIAGARA

HUMIDIFYING • AIR ENGINEERING EQUIPMENT

plant: **George G. Hollstein.** Superintendent of the company's chemical division: **Elmer M. Evenson.** New assistant superintendent: **Kenneth R. Winkler.**

William E. Dominick and **Paul L. Ahern.** Now members of Abbott Laboratories' patent department. Mr. Dominick was formerly a patent attorney in the Chicago law department of Swift & Co. Studied chemistry at Cornell, law at George Washington Law School. Mr. Ahern formerly specialized in patent and trade mark practice with the Chicago firm of Spencer, Johnston, Cook and Root. Studied chemistry at the University of Denver, law at DePaul University.

Lawrence H. Byrd. Area production superintendent in charge of drilling and producing at Humble Oil & Refining Co.'s California operations. Joined Humble in 1937.

G. B. Meredith. Assistant to the vice president, Solvay Process Division, Allied Chemical & Dye Corp. Formerly chief chemist of the division's South Point, Ohio, nitrogen products plant. Came to Solvay as a chemist at the company's Syracuse Works in 1927. Job history: assistant control chemist, assistant plant chemist, plant chemist, chief chemist.

G. B. Meredith

P. F. Swanson

Paul F. Swanson. Manager, process engineering department, M. W. Kellogg Co. Joined Kellogg 25 years ago immediately upon graduation as a chemical engineer from the University of Kansas. Prominent in the development of the first continuous catalytic cracking process utilizing the fluid catalyst principle.

Hillary Robinette, Jr. Chemical consultant to business and industry at his new offices in Ardmore, Pa. Since 1948, research director of Amalgamated Chemical Corp. Continues as a consultant to Amalgamated on textile wet processing problems, paper and leather chemistry. Earlier positions: manager

of the new products division of Publicker Industries; member of the staff of the sales promotion division of Commercial Solvents Corp.; president of the W. H. & F. Jordan Mfg. Co.; research chemist at Rohm & Haas Corp.

Harold Holden. President and director of Eastern Corp., Bangor, Me. From 1948 to present, vice president in charge of sales, Oxford Miami Paper Co. Earlier positions: chief chemist, Falulah Paper Co.; part owner and New England manager, Paper Makers Chemical Co.; sales manager, Oxford Paper Co.

H. Holden

M. J. Bozsin

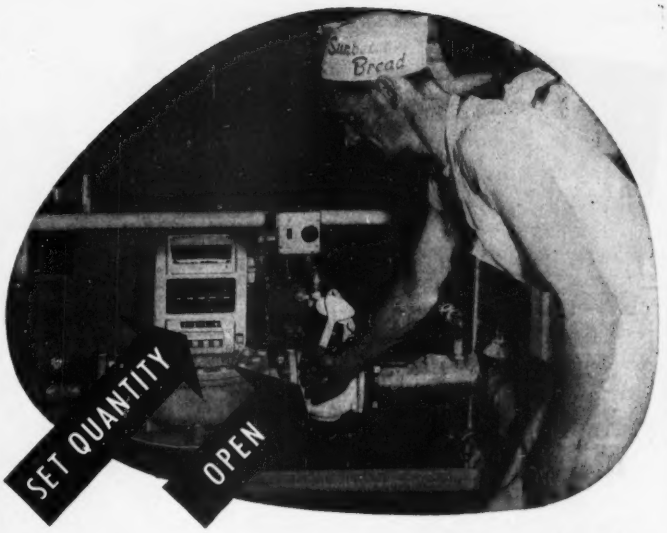
Michael J. Bozin. Chief chemist, Ferro Corp. of Cleveland. Formerly, process research engineer at the company's Cleveland plant. With the company since 1929.

John J. McKetta. Editorial director, *Petroleum Refiner*. Formerly, professor of chemical engineering at the University of Texas and chairman of the department from 1949 to 1951. Chemical engineering graduate of Tri-State College, Angola, Ind.

Loring F. Coes, Jr. From research engineer to assistant director of research and development in charge of the laboratory's organic section, Norton Co., Worcester, Mass.

Max Key. Vice president of Asahi-Dow Ltd., recently formed associate of Dow Chemical International Ltd. and the Asahi Chemical Industry Co., large Japanese chemical and textile manufacturer. Has been assistant production manager of Dow Chemical's saran department. New president of Asahi-Dow: **Tadayoshi Kitamura,** former managing director of Asahi Chemical.

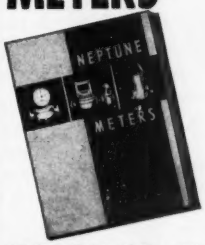
Neil S. Kocher. Manager of film manufacturing, Eastman Kodak's Kodak Park Works in Rochester, N. Y. Since 1947, assistant general superintendent of Kodak Park's film departments. Joined the company in 1920 to work in the chemical plant. Syracuse University graduate. New assistant manager of film manufacturing: **Louis K. Eilers,** formerly assistant to the manager. Came to



Exact Automatic Formula Control

WITH

NEPTUNE METERS



Hitting formulas "on the nose" time after time is automatic with these new Neptune Auto-Stop liquid meters. With an Auto-Stop on every liquid line feeding into the batch or blending, the operator simply pushes buttons to set the number of gallons or pounds required by the formula. He then opens the valve and the meter does the rest, shutting off at the exact quantity.

Neptune meters pay for themselves by eliminating spoilage, spillage, over-filling and the unsanitary muss and fuss of gauge sticks, pails or batch tanks. They stop waste of valuable ingredients and prevent over-dilution with water that must later be removed. Their accurate figures take the guesswork out of inventory control too. The Neptune Auto-Stop is only one of many Neptune meters available for handling over a hundred different industrial liquids. Why not ask for a complete plant survey at no obligation?

Send for new Neptune Liquid Meter Bulletin 566-M

NEPTUNE METER COMPANY

50 West 50th Street, New York 20, N. Y.

Branch Offices and Telephone Numbers

ATLANTA	*Lamar 5016*	N. KANSAS CITY	*Norclay 3345*
BOSTON	*Hancock 6-9123*	LOS ANGELES	*Michigan 5112*
CHICAGO	*Sacramento 2-4014*	LOUISVILLE	*Jackson 2293*
DALLAS	*Riverside 4904*	PHILADELPHIA	*Locust 4-3170*
DENVER	*Main 3221*	PORTLAND	*Broadway 0100*

SAN FRANCISCO ..... *Garfield 1-8144*

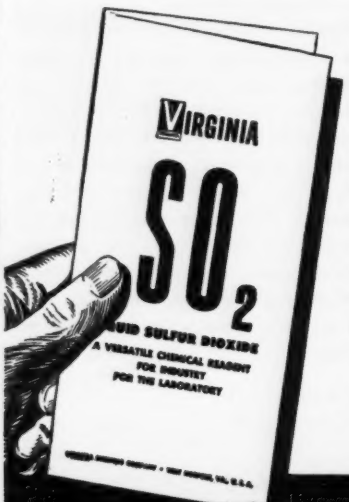
IN CANADA: TORONTO, ONTARIO ..... *Lindhurst 5495*

Just reach for the phone!

Millions of pounds on wheels

The need for Sulfur Dioxide (SO_2) may arise in your plant as suddenly and emphatically as that for a six-gun in the old West. When this occurs, call "Virginia," and things will happen fast.

"Virginia" is the world's biggest producer of mobile "ESOTOO" —liquid sulfur dioxide with wheels under it, ready to be rushed to your rescue when you get in a jam. "Virginia" tank cars, trucks, drums, cylinders in ample numbers assure rapid shipment of your order. Our huge annual production of SO_2 and an abundant storage capacity make this unmatched service possible.



Call upon us also for the technical aid you may need for best results in using "Virginia" Liquid SO_2 in your products and processes. This counsel has proved invaluable over the past 30 years in applying our versatile chemical as a reducing, bleaching and neutralizing agent, preservative and antichlor, and for pH control—in more than 40 diverse industries. Send for the "Virginia" SO_2 folder today.

VIRGINIA SMELTING COMPANY
Box 21, West Norfolk, Virginia

Field Offices:
NEW YORK
BOSTON
PHILADELPHIA
DETROIT
CHICAGO
ATLANTA

VIRGINIA Chemicals

the Kodak Park chemical plant in 1934 in charge of the semi-plant research unit for cellulose ester manufacture. Doctorate in chemistry from Northwestern.

A. C. Hopkins, Jr. Director of commercial development, General Mills Research Laboratories, Minneapolis. Formerly with American Maize Products Co. as assistant manager of the bulk sales department. From 1943 to 1947, with the technical service division of Commercial Solvents, Inc. From 1933 to 1943, technical supervisor for General Chemical Co. Studied at Hampden-Sydney College and MIT.

A. C. Hopkins, Jr.

J. M. Crockin

Jerome M. Crockin. In charge of coordinating engineering and manufacturing activities of the cottonseed oil extraction program, Lukenweld, division of Lukens Steel Co. Formerly, director of process development activities. Previous employers: Michigan Mining and Technical College; Hercules Powder Co.; Solvay Process Co.

Laurence T. Eck. Plant manager of the cobalt metal refinery now under construction on National Lead Co.'s property at Fredericktown, Mo. Since last year, chief development engineer in the company's titanium division development engineering department in Sayreville, N. J. Joined the company in 1945. Prior to that, research engineer at the Raritan Copper Works of the International Smelting and Refining Co., Perth Amboy, N. J. New plant superintendent at Fredericktown: **G. Edward Peters,** chief chemist in the analytical laboratories of the St. Louis Smelting and Refining Division since 1948. Chemical engineering graduate of Washington University.

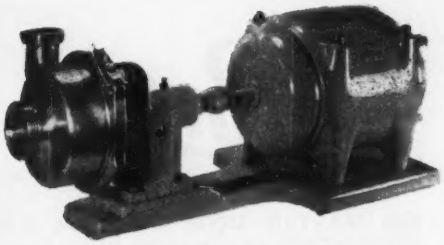
E. S. Pettyjohn. Vice president, Institute of Gas Technology. Since 1945, director of the institute. From 1940 to 1945, on duty as Captain with the U. S. Navy. Earlier jobs: research engineer for the Michigan Gas Assn.; sales and

Here are the PUMPS that will handle ANY PRODUCT that will flow to them . . .

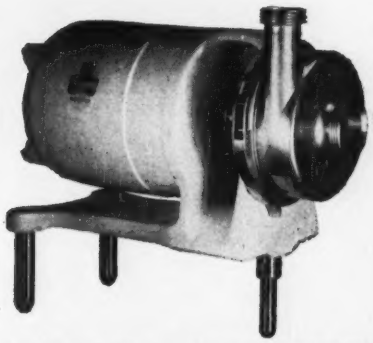
ANY product that will flow to them can be handled efficiently and economically with Tri-Clover non-agitating centrifugal pumps. Illustrated are three of the many Tri-Clover pump models which are used for dairy and food processing, brewing and bottling, chemical and general industrial applications.

Designed for efficient liquid transmission and low cost maintenance, these pumps feature patented screw type impellers with sanitary impeller clips, inert carbon seals easily removed for cleaning, streamlined lightweight heads with a minimum of parts, and the exclusive Tri-Clamp casing construction which permits fast, easy pump assembly or disassembly.

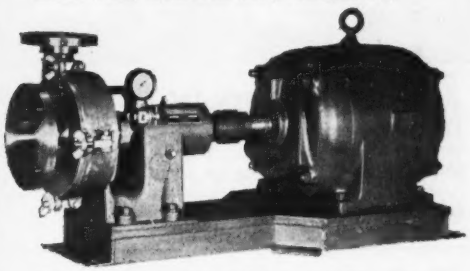
Tri-Clover's exclusive developments are the result of over 30 years of specialized engineering experience and thorough knowledge of liquid handling. Let our engineering staff work with you in solving your pumping problems.



This model has been designed for the non-agitating, efficient pumping of milk, food products such as diced carrots, cream style corn, tomatoes, applesauce, relish and beverages. It is also practical in breweries and for the pumping of drugs and chemicals in solution.



Designed for very efficient operation at 1800 and 3600 RPM, and especially where high speeds are required, through heaters, coolers, filters, clarifiers, etc. The 3600 RPM model is especially applicable in the dairy industry, where high head and low capacity are essential and for handling low and medium viscosity liquids in the food processing industry.



Here is the model that is in demand to pump Latex, water, brine, light oils, chemicals, paints, brewery products, and liquids in the food processing field where lines are of heavy I. P. S. type. This model offers quick disassembly features for ease in cleaning.

EXPORT DIVISION: 8 South Michigan Avenue
Chicago 3, Illinois, U. S. A.

SEND FOR THE TRI-CLOVER PUMP CATALOG—*One of the most complete, useful pump catalogs ever compiled. Contains engineering data on all types of pump applications. Write for your copy of Catalog 250 today.*

Tri-Clover®
MACHINE CO.
Kenosha, Wisconsin

TRIALLOY AND STAINLESS STEEL SANITARY FITTINGS, VALVES, PUMPS, TUBING, SPECIALTIES

FABRICATED STAINLESS STEEL INDUSTRIAL FITTINGS AND INDUSTRIAL PUMPS

THE Complete LINE

P152

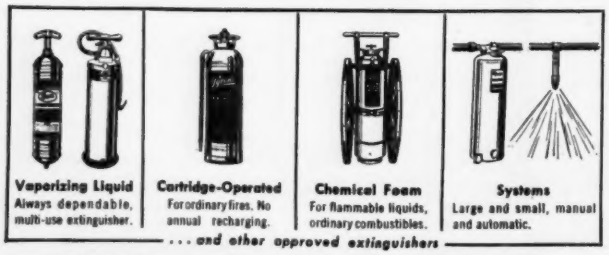
Pyrene

NO MATTER HOW CAREFUL YOU ARE
YOU'RE SAFER IF YOU HAVE PYRENE

There's a Pyrene for every fire hazard

The *best time* to buy complete fire protection is *in time*. And the best protection money can buy is Pyrene.* Whatever the fire hazard, there's a Pyrene to cope with it—for Pyrene makes everything from hand extinguishers to complete automatic fire-fighting systems.

*T.M. Reg. U.S. Pat. Off.



Vaporizing Liquid Always dependable, multi-use extinguisher.

Cartridge-Operated For ordinary fires. No annual recharging.

Chemical Foam For flammable liquids, ordinary combustibles.

Systems Large and small, manual and automatic.

... and other approved extinguishers

PYRENE MANUFACTURING COMPANY
593 Belmont Avenue Newark 8, New Jersey
Affiliated with C-O-Two Fire Equipment Co.

development engineer for Leader Industries; chief engineer of Mervin Building Corp.; associate professor of chemical engineering, University of Michigan. New dean of the institute: **J. D. Parent,** who has been supervisor of the chemical engineering section since 1943. Previously served successively on the faculties of Ohio State, Loyola of Chicago and Kansas State. Doctorate in chemical engineering from Ohio State. New assistant research directors: **Henry R. Linden** and **C. G. von Fredersdorff.** Mr. Linden: with the institute's staff since 1947 as supervisor of oil gasification. Mr. von Fredersdorff is now writing his dissertation for a Ph.D. in chemical engineering at Illinois Institute of Technology, affiliate of IGT.

Charles H. Dickens. General chemist in the New York office, Universal Atlas Cement Co. Since 1948, manager of the company's Waco, Tex., plant. Prior to this was chief chemist there for 19 years. Joined the company in 1922 at its Independence, Kans., plant serving there as laboratory assistant and assistant chemist until 1929 when he was transferred to the Texas plant.

Ralph J. Holaschlag. Operating superintendent at Monsanto's John F. Queeny plant. Formerly group leader in charge of interm manufacturing facilities for the company's organic chemicals division. Joined Monsanto in 1938 as an analyst; later became a research chemist and group leader. Replacing him as group leader: **Delwin M. Campbell Jr.,** formerly a research chemist. Joined Monsanto in 1936. He is an MIT graduate in chemical engineering.

V. C. Williams. Director of chemical development, Mississippi River Fuel Corp., St. Louis, Mo. Formerly, associate director of research, central research laboratories, General Aniline and Film Corp.

Richard F. Schaffer. First vice president, Technical Assn. of the Graphic Arts. Head of the department of chemical engineering at Pratt Institute. With the institute since 1945.

Charles W. Walton. General manager of the adhesives and coatings division of Minnesota Mining & Mfg. Co. Has been general manager of the new products division since 1948. Joined 3M in 1947 as assistant to the executive vice presi-

dent in charge of manufacturing. Doctorate in physical and colloid chemistry from the University of Michigan.

W. Kenneth Menke. Vice president in charge of chemicals, Pittsburgh Coke & Chemical Co. Previously with Monsanto for 17 years, most recently as director of the development department.

Harrison C. Blankmeyer. Scientific director of the Fiberglas research and development laboratories, Owens-Corning Fiberglas Corp., Toledo. Since early 1951, assistant to the president of Kingan & Co., Indianapolis meat packing firm. From 1937 to 1951 with Joseph E. Seagram & Sons as: technical engineer, director of education, plant manager, technical director, services manager, assistant to the vice president.

H. C. Blankmeyer

R. L. Granger

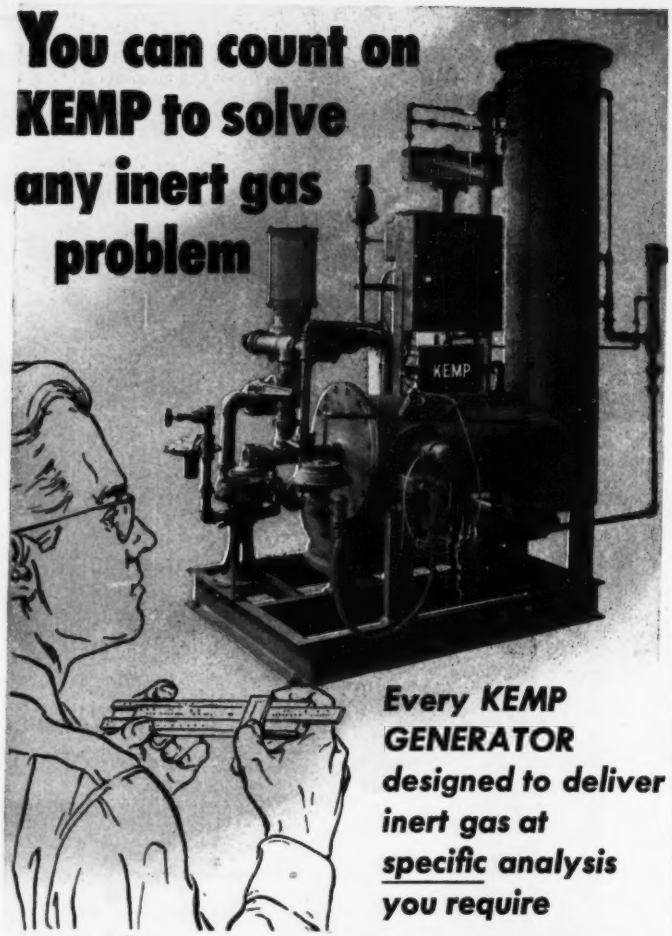
Robert L. Granger. Manufacturing superintendent of the yarn area of Chemstrand Corp.'s nylon filament yarn plant under construction near Pensacola, Fla. Since 1951, design project manager for the company. Previously a research and development engineer for American Viscose Corp. for six years. From 1935 to 1940, chemical engineer, Barrett Co. From 1940 to 1945, chief chemist, Philadelphia Electric Co.

R. W. Diamond. From vice president and general manager to executive vice president, Consolidated Mining & Smelting Co. of Canada Ltd. To general manager: **R. D. Perry,** formerly assistant general manager. A new senior manager of the research and development division: **R. C. Bell,** formerly at the central research laboratory at Trail, B. C. Joined the staff of the company's chemicals and fertilizers division in 1941. Graduate of the University of British Columbia.

Henry W. Kruschwitz, Jr. From research chemist to sales engineer, Metal Hydrides Inc., Beverly, Mass. Dartmouth graduate. New superintendent, chemical hydrides divi-

DIRECT HEATING OF VAPORS
DIRECT HEATING OF LIQUIDS
If your plant requires
DOWTHERM INDIRECT HEATING
STEAM GENERATORS
STEAM SUPERHEATERS
GAS CRACKING HEATERS
. . . place the selection of the specific type in specialized hands . . . and obtain optimum efficiency.
Petro-Chem Development Company engineers are heating specialists . . . they can supply the whys and wherefores of indirect versus direct heating and the economics of both.
Every day more than 950, oil and gas fired, Petro-Chem Iso-Flow installations in the petroleum, chemical and allied industries, demonstrate the efficiency of their design and installation.
PETRO-CHEM DEVELOPMENT CO., INCORPORATED
120 EAST 41ST STREET, NEW YORK 17, N. Y.
REPRESENTATIVES

You can count on KEMP to solve any inert gas problem



Every KEMP GENERATOR designed to deliver inert gas at specific analysis you require

DAY AFTER DAY Kemp users throughout the chemical field report: Kemp Inert Gas Generators *maintain a specific analysis* of chemically clean inert gas *regardless* of demand . . . eliminate the possibility of mixture fluctuations in critical processing . . . offer the finest choice of flexibility in design. Fast-starting, easy-to-operate Kemp Generators also *save* you both *time* and *money* by reducing costly warm-up period necessary for starting other makes. You can't go wrong when you specify Kemp.

Set it . . . forget it!

The Kemp Industrial Carburetor, standard equipment and the very heart of every Kemp installation, assures you complete combustion . . . without tinkering . . . without waste. Uses ordinary gas right from mains. Every Kemp Design includes complete up-to-the-minute fire checks and safety devices. Why not find out how Kemp can help you with your problems?

KEMP OF BALTIMORE

INERT GAS GENERATORS

Write for Bulletin I-10 for technical information

THE C. M. KEMP MFG. CO.
405 E. Oliver Street, Baltimore 2, Md.

NAMES IN THE NEWS, cont. . .

sion: **Robert D. Gray.** With the company since 1943, the past four years with the division. Graduate of Boston University.

Robert S. Burns. President, Western Electrochemical Co., Culver City, Calif. Has been general counsel and a director of the company since 1944. Has been president of Standard Steel Corp., Los Angeles, since 1938; continues as chairman of the board of directors.

George B. Hamilton. General manager, amino products division, International Minerals & Chemical Corp., Chicago. Has been general sales manager since 1950. Joined the company in 1947. Graduate of Iowa State College.

John K. Ferguson. Resident manager at St. Regis Paper Co.'s new kraft pulp and paper plant at Jacksonville, Fla. New general superintendent at the plant: **John A. McDermott.** Paper Mill superintendent: **E. A. Murphy.** Pulp mill superintendent: **Arnold Harrison.** Manager of production for the company's Southern division: **U. J. Westbrook.**

Godfrey L. Cabot. Guest of honor at a dinner last June 17 of the Boston area members of the Society of Chemical Industry (American section). At the age of 92, the oldest living member of the organization. President of Godfrey L. Cabot, Inc. Remains active in civic, aeronautical, chemical and professional affairs.

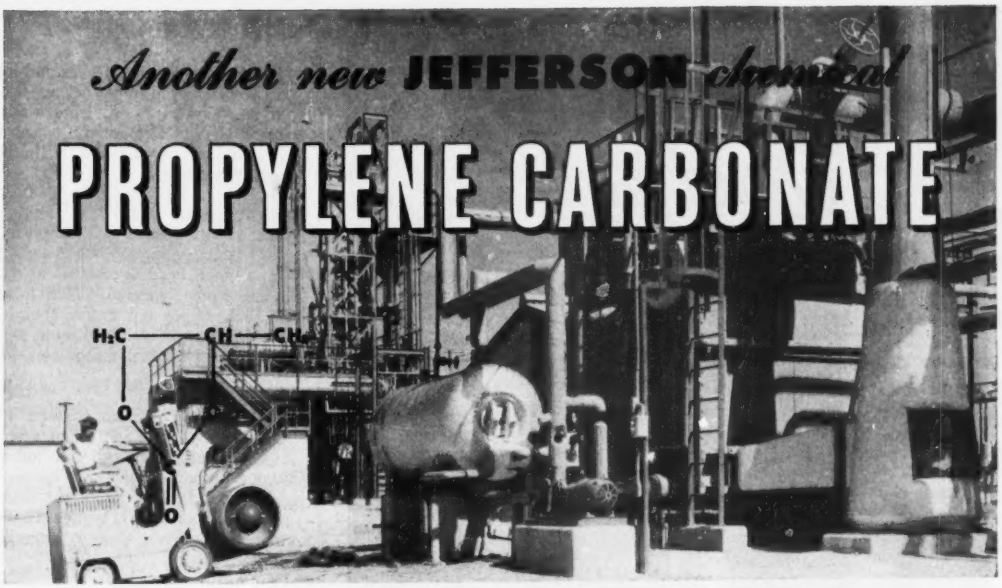
Glennard A. Lucas. Project engineer at GE's silicone plant in Waterford, N. Y. Has been doing research work in the chemical division's new product development laboratory at Pittsfield, Mass. Came to Pittsfield in 1942. Doctorate from Columbia.

Robert J. Geary. To undertake research and development of agricultural chemicals in the United States and Canada on behalf of Farbenfabriken Bayer, Leverkusen, Germany. Formerly president and member of the board of the Geary Chemical Corp. and vice president and member of the board of Chemagro Corp.

Palmer W. Griffith. Recipient of the eleventh annual John Wesley Hyatt Award for achievement of wide importance to the plastics industry. West Coast technical sales director, American Cyanamid, since 1943.

Another new **JEFFERSON** *chemical*

PROPYLENE CARBONATE



now available in pilot-plant quantities

Properties of a typical sample of Jefferson's Propylene Carbonate are:

Boiling point, °C	242
Freezing point, °C	−45
Flash point (open cup), °F	270
Refractive index at 20°C	1.4209
Specific gravity, 20/4 °C	1.2057
Appearance	Mobile water-white liquid
Viscosity, centistokes	
at −40°F	19.4
at 100°F	1.67
at 210°F	0.78

Suggested Applications:

hydraulic fluids
solvent and selective solvent
chemical intermediate
hydroxypropylating agent

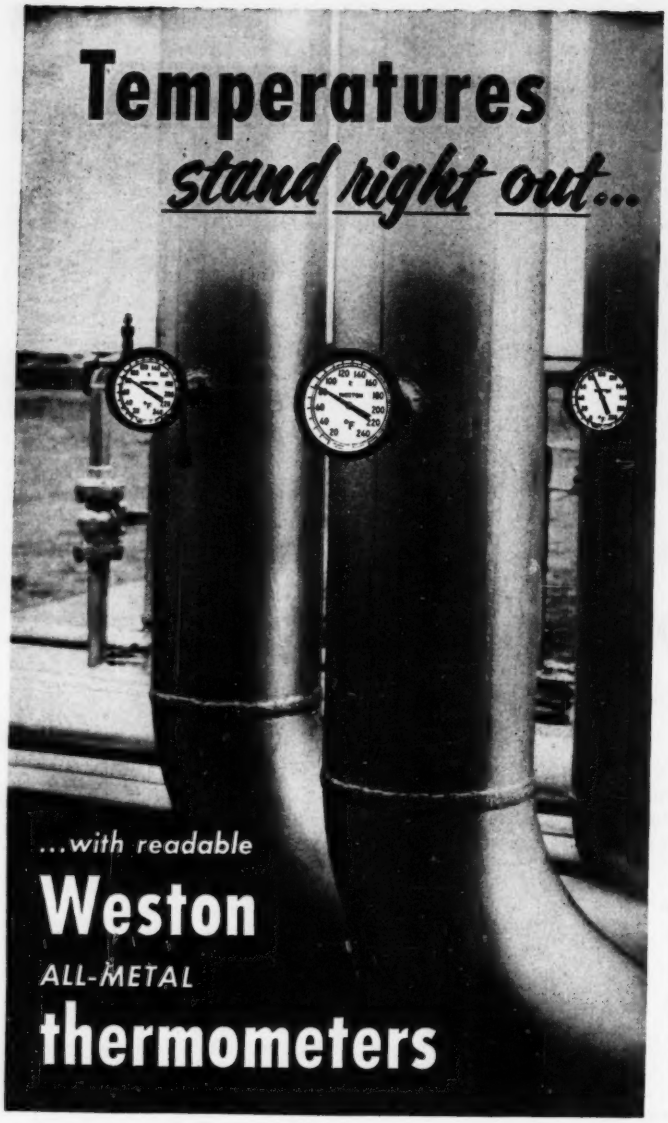
You may obtain technical information and experimental samples* for research and development by writing to our Market Development Division, Dept. G.

★ **Ethylene Carbonate samples and data are also available.**

Jefferson
CHEMICAL COMPANY, INC.
260 MADISON AVENUE, NEW YORK 16, N. Y.

Essential Chemicals From Hydrocarbon Sources:

Ethylene Oxide
Ethylene Glycol
Ethylene Dichloride
Diethylene Glycol
Monoethanolamine
Diethanolamine
Triethanolamine



Large, readable scales . . . durable, all-metal construction . . . stainless steel stems . . . accuracy within 1% of thermometer range. Available in types, sizes, stem lengths and ranges for all applications. Write for literature.
WESTON Electrical Instrument Corporation,
617 Frelinghuysen Avenue, Newark 5, N. J.
. . . manufacturers of Weston and TAG instruments.

WESTON TAG 9882 WESTON Instruments

INDICATE . . . RECORD . . . CONTROL

NAMES IN THE NEWS, cont. . .

Joined the company in 1922 and for 13 years engaged in plastics research at its Warners, N. J., laboratories. From 1935 to 1943, he was engaged in sales engineering and technical service activities.

D. P. Stevenson. Head of the physics department, Shell Development Co., Emeryville, Calif. Assistant department head since 1950. Doctorate from Princeton. New head of the catalysis and surface chemistry department: **J. N. Wilson,** previously in charge of the physics department.

Frank A. Rogers. From engineer in chemical ordnance branch, engineering division, chemical and radiological laboratories, Army Chemical Center, Md., to chief of the engineering's specification branch. Graduate of Tri-State College, Angola, Ind.

OBITUARIES

Albert B. Newman, 64, professor of chemical engineering at City College of New York and consultant and research engineer to leading chemical companies, died May 9.

Edward Henry Berger, 58, asphalt consultant for Johns-Manville, died in Roseland, N. J., May 12. Joined the company in 1924 as a technical assistant in research and product development.

Wallace C. Eshelman, 63, general superintendent of Bethlehem Pacific Coast Steel Corp.'s South San Francisco steel plants since 1937, died at his home in Menlo Park, Calif., May 13. A chemical engineering graduate of the University of Washington, he was widely known in steel engineering circles on the Pacific Coast for more than a quarter of a century.

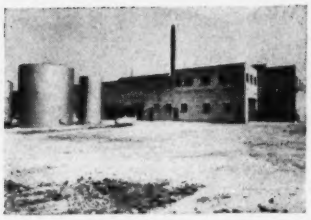
A. B. Lamb, 72, Erving professor-emeritus of chemistry at Harvard and for 32 years editor of the Journal of the American Chemical Society, died May 15.

Clyde Evans, 32, superintendent of the Louisiana Agriculture Supply plant which processes fertilizer, died at Baton Rouge May 29.

Michel J. Fortier, 48, vice president and general manager of Sherwin-Williams Co. since 1944, died May 31. He joined the John Lucas Co., a Sherwin-Williams subsidiary, in 1928.

INDUSTRIAL NOTES

NEW FACILITIES



Stepan-Chemical Co.—A Chicago building to house a pilot plant section and research laboratories and the firm's general and sales offices.

Allied Chemical & Dye Corp.—A nitrogen division formed to take over the manufacturing and related operations of the nitrogen and organic sections of the Solvay Process Division. The latter continues to be responsible for the production and sale of alkali, chlorine and related products. Hugo Riemer, formerly executive vice president of Solvay, is president of the nitrogen division.

Quaker Oats Co.—A $600,000 addition to its furfural manufacturing facilities in Memphis. The new unit will make furfuryl alcohol and will not require any increased production of furfural at the Memphis plant.

Zonolite Co.—A laboratory in Evans, ton, Ill., to find new industrial uses for vermiculite of which it is the world's largest producer.

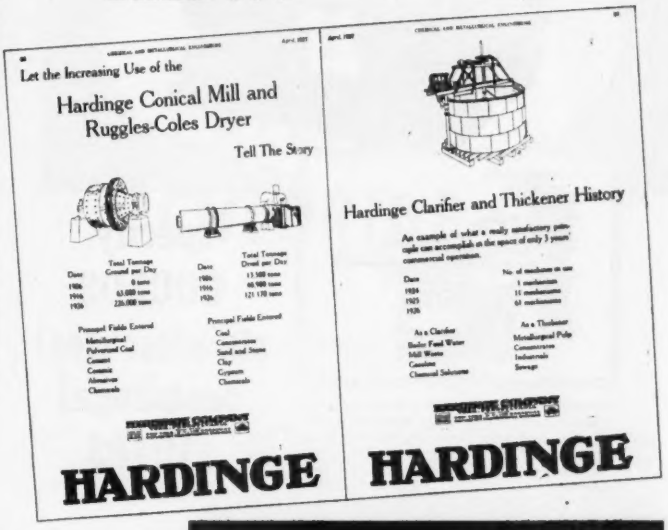
Foote Mineral Co.—The world's largest and most modern lithium chemical processing plant at Sunbright, Va. It will be operating by mid-1953. The plant will more than double present U. S. capacity for lithium chemicals.

Reichhold Chemicals, Inc.—A south Atlantic division in Jacksonville, Fla., which will specialize in cellulose chemicals. The company has taken over the Reasor-Lewis Corp. naval stores plant and will use it as a base for expansion of company activities into Cuba and Puerto Rico.

Celanese Corp. of America—A textile division for operating all the textile activities of the company. Simultaneously, a market development department of the textile division has been created for the purpose of

1927

THEN . . .



. . . and now 1952

Again Hardinge participates with ***CHEMICAL ENGINEERING*** in celebrating a 25-year milestone. The above advertisement appeared in the 25th anniversary issue of *"CHEM AND MET"* in 1927.

Since 1927, the total number of ***HARDINGE MILLS*** built has doubled. For example—right at the moment over 16 Tricone and 50 Conical Mills are on order—in the U. S. and Canada—to say nothing of the many other Hardinge mills now being built by our licensees in England, Belgium and France.

Since 1927, the total number of ***RUGGLES-COLES DRYERS*** has nearly doubled.

Since 1927, the total number of ***HARDINGE CLARIFIER AND THICKENER*** installations has increased 13 times—not to mention the many other installations of related Hardinge equipment such as Constant-Weight Feeders, "Electric Ears", Heavy-Media Separators, Classifiers, and Filters, all added to the Hardinge line in more recent years.

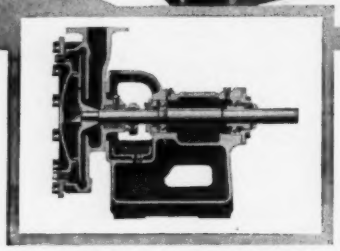
WRITE FOR COMPLETE HARDINGE LINE BULLETIN 100-A-11.

HARDINGE
COMPANY, INCORPORATED

YORK, PENNSYLVANIA—240 Arch St. Main Office and Works

NEW YORK 17 • SAN FRANCISCO 11 • CHICAGO 6 • HIBBING, MINN. • TORONTO 1
122 E. 42nd St. 24 California St. 205 W. Wacker Dr. 2016 First Ave. 200 Bay St.

For economy in handling corrosive liquids . . .



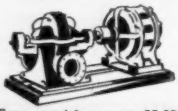
With the stuffing box on suction side of impeller, pressure on it is limited to the suction head only, assuring long packing life and freedom from excessive leakage. Interior of pump can be inspected and cleaned and impeller can be removed or replaced without disturbing the piping.

specify GOULDS stainless steel centrifugal PUMPS

Other GOULDS PUMPS for processing plants

This highly efficient Goulds single stage centrifugal pump (Fig. 3169) is well suited for general processing purposes. Ten sizes.

Nonclogging impeller of this vertical sump pump (3047) will handle water containing large solids or fibrous materials.



For capacities up to 15,000 G.P.M. Heads up to 500 ft. Check the specifications of this Goulds ball bearing double suction centrifugal (3450).

One plant engineer reports better than a seventy-five percent cost saving by handling an especially erosive slurry with Goulds Fig. 3705 Stainless Steel pumps. The pumps previously used not only cost almost four times as much as the Goulds pumps, but the Goulds pumps have already been in service over twice as long.

The entire fluid end of this Goulds Fig. 3705 pump is of stainless steel mounted on a cast iron support. It is regularly carried in stock in No. 316 and FA 20 stainless steels, but other metals and alloys can be supplied for all parts coming in contact with the liquid.

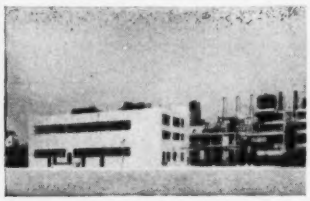
This pump has several features that contribute to economical, 24-hour service with acid and alkaline liquors which quickly corrode standard iron or bronze pumps. Bulletin 725.3 describes this Goulds unit in detail. We will be glad to send you a copy.

MEMBER

Goulds PUMPS INC. Seneca Falls New York

INDUSTRIAL NOTES, cont. . .

aggressively promoting the use of the company's fibers.



Corn Products Refining Co.—A plant at Argo, Ill., which is manufacturing glucuronic acid in the lactone form. The first of its kind the plant will make glucuronolactone available in commercial quantities.

John Powell & Co.—A new insecticide plant at Elkton, Md., purchased from the Edco Corp.

Quaker Rubber Corp., division of H. K. Porter Co., Philadelphia—A branch warehouse and sales office in Lockland, Cincinnati.

Hercules Powder Co.—A biological laboratory to be built at its experiment station near Wilmington. The $400,000 project will be completed by April 1953.

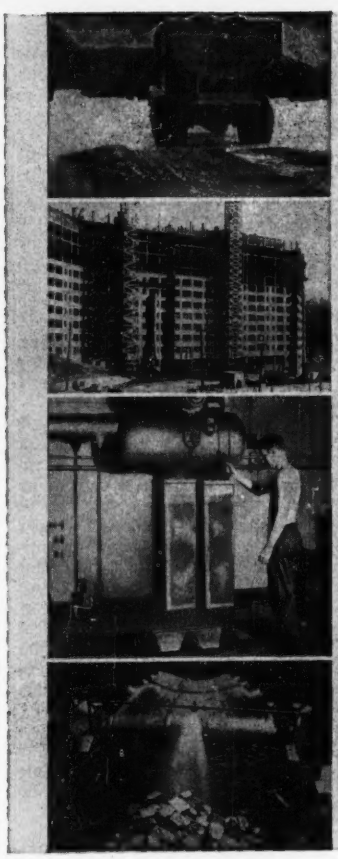
Abbott Laboratories—A branch office in Teterboro, N. J., to be completed this fall. It will replace the present New York office.

Chemical Products Corp., Cartersville, Ga.—A benzene chlorination plant to replace one which was destroyed by fire in 1949. With the exception of the chlorinator, all equipment in the new plant will be installed outdoors.

Kaiser Aluminum & Chemical Corp.—New equipment and addition to its Permanente, Calif., aluminum foil mill which will double the company's production bringing it from 12 million to 18 million lb. annually. Expansion is expected to be completed next year. The company is also doubling capacity of its aluminum reduction plant at Chalmette.

Lindberg Engineering Co., Chicago—A second plant to manufacture laboratory furnaces, small induction heating units, Fisher type melting furnaces and atmosphere generators.

Black Rock Desert Mineral Co.—A refining plant and additional milling facilities at its Black Rock sulphur property in Nevada. The company



NEED CALCIUM CHLORIDE?

Check Solvay First

SOLVAY
Alkalies Chemicals
Since 1881

CALCIUM CHLORIDE

for
- Dustlaying
- Drying Air
- Removing and Skidproofing Ice
- Concrete Work
- Refrigeration Brine
- Freeze-proofing Coal
- Industrial Waste Treatment
- Chemical Manufacturing
- Industrial Processing

And Be Sure of getting the dependable quality and uniformity offered by America's oldest and largest producer of alkalies and associated chemicals.

And Be Sure of delivery service from strategically-located major plants and over 700 local stock points, distributors and dealers.

And Be Sure of a special Calcium Chloride Technical Service and exclusive, authoritative literature that provides expert advice on the many individual uses of Calcium Chloride.

And Be Sure of sales service that is handled by a staff of thoroughly trained, helpful salesmen operating from thirteen convenient branch sales offices . . . plus a nation-wide organization of selected jobbers and representatives.

THE SOLVAY PROCESS DIVISION
ALLIED CHEMICAL & DYE CORPORATION
61 Broadway, New York 6, N. Y.

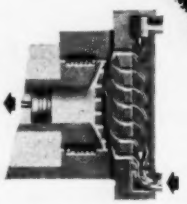
BRANCH SALES OFFICES:
Boston • Charlotte • Chicago • Cincinnati • Cleveland • Detroit • Houston
New Orleans • New York • Philadelphia • Pittsburgh • St. Louis • Syracuse

Soda Ash • Caustic Soda • Caustic Potash • Chlorine • Calcium Chloride
Potassium Carbonate • Sodium Bicarbonate • Specialty Cleaners • Sodium Nitrite
Ammonium Bicarbonate • Para-dichlorobenzene • Ortho-dichlorobenzene
Monochlorobenzene • Ammonium Chloride

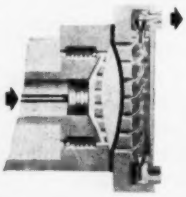
Lapp

Auto-Pneumatic

PULSAFEEDER



INTAKE STROKE



DISCHARGE STROKE

No packing or other leak-likely gland can be in contact with chemical being handled by the Lapp Pulsafeeder. A hydraulically-balanced diaphragm acts as a floating partition, without mechanical load or pressure differential—assures isolation of chemicals being pumped from all working pump parts. Pumps against pressures to 2,000 lbs., at constant pumping speed—variable flow for continuous processing results from variation in piston-stroke length-controlled by instrument air pressure responding to any instrument-measurable processing variable.

WRITE FOR NEW BULLETIN No. 300, just issued. 24 pages of description, specifications, typical applications, flow charts. Inquiry Data Sheet included from which we can make specific engineering recommendation for your processing requirement. Write Lapp Insulator Co., Inc., Process Equipment Division, 341 Maple Street, Le Roy, N. Y.

has allotted $100,000 to increase production to 400 tons of agriculture sulphur and 125 tons of pure chemical mineral daily.

Marshall-Eclipse Division, Bendix Aviation Corp.—A special synthetic resin plant at Green Island, N. Y. To consist of two large production units, the plant will produce primary phenolic resins as well as resins of other types. Much of the output will be used in other products manufactured by Bendix Aviation at this and other divisions. Blaw-Knox expects to have the plant completed by the latter part of 1952.

Minneapolis-Honeywell Regulator Co.'s valve division—A research center in Philadelphia to support an extensive development program in industrial valves. Object of the new program: to find substitute valve materials to relieve the critical alloy situation.

Perkin-Elmer Corp.—An instrument laboratory in Norwalk, Conn., for evaluating infrared methods of analysis as applied to specific problems of prospective customers.

Arapahoe Chemicals, Inc.—A warehouse at Boulder, Colo., including packing, shipping and receiving facilities.

Shell Oil Co.—A multi-million dollar ammonia production plant under construction at Ventura, Calif. Designed primarily to meet growing demands in Southern California for ammonia fertilizer, the plant will produce 150 tons of anhydrous ammonia daily. Carbon dioxide will be a byproduct.

Snellstrom Lumber Co. and **Viking Plywood & Lumber Co.**—A new plywood plant with 3 million square feet capacity is scheduled to be built in July.

Arizona Fertilizers, Inc.—A new fertilizer and insecticide plant at Yuma, Ariz., and an insecticide plant in Toltec, Ariz. Capacity of each is seven tons per hour.

California Spray Chemical Corp.—A $125,000 warehouse-office building at Whittier, Calif.

Scott Paper Co.—A $21 million plant at Everett, Wash.

Baird Associates, Inc., Cambridge, Mass.—A process controls division

devoted to the applications of continuous process control equipment based on infrared analysis and the further development of effective instrumentation in this field.

Keasbey and Mattison Co.—A $2.8 million plant at Santa Clara, Calif., for production of asbestos-cement water pipe. Plant will turn out 4 to 16 in. pipe at a rate of 4½ tons daily when it goes into production in about a year. The company formerly shipped pipe to the West Coast from its plant at St. Louis, but high freight rates and increasing western business led to its decision to build the Santa Clara plant.

Sterling Electric Motors, Inc., Los Angeles—A sales office in Baltimore headed by E. Stephen Farlow.

Shields Rubber Co., Pittsburgh, Pa., has moved its Chicago branch operations into larger quarters in 108-112 North Clinton St. The company is one of the country's largest distributors of industrial rubber products.

Chain Belt Co. has moved to a new administration building at 4701 West Greenfield Ave., Milwaukee.

Shell Chemical Corp. has moved the offices of its Newark, N. J., sales district to larger quarters at 10 Commerce Court.

Pi-Square Engineering Co., Boston, to provide consulting services in the application of computing aids to rational engineering analysis, particularly in dynamics and transient performance. Partners in the venture are Henry M. Paynter and George A. Philbrick.

Philips-Palit Corp., New York, to supply India with equipment for chemical and oil engineering, power projects, heavy construction.

Quaker Rubber Corp. division of H. K. Porter Co., Philadelphia—Expanded rubber roll covering facilities to meet increased demands of the pulp and paper, steel, printing and textile industries. With its new equipment and plant layout Quaker can now apply coverings to rolls measuring 17 ft. in length and weighing as much as 16 tons.

NEW REPRESENTATIVES

Curran Corp., owner of Gunk self-emulsifying and self-scouring solvents for degreasing and decarbonizing, has appointed Kunk Pacific Southern Co., Pasadena, Calif., as

Gallons
NOT GUESSES!
BUILDERS
Propeloflo
the ideal propeller-type meter for measuring the actual flow of water in pipelines 2" to 36" and larger.

FEATURES

"VENTURI DESIGN" (in meters 4" and larger) for better velocity distribution at the point where the fluid acts on propeller.

High Accuracy and Wide Range, measuring within ± 2% of actual flow from about 10% to 100% of rated capacity.

"Open Upper Limit", temporary overload range of 150% of rated capacity.

As Easy to Install as a valve or fitting.

Low Loss-of-Head, lower than most other types of flow meters.

Secondary Instruments, cable driven or electrically operated, for Totalizing, Indicating and/or Recording flow at nearby or remote locations.

Intermittent Service, where the line occasionally drains dry, Propeloflo registers accurately, without attention, when flow is resumed.

For complete information and Bulletin 380-G2A, address Builders-Providence, Inc. (Division of Builders Iron Foundry), 369 Harris Ave., Providence 1, Rhode Island.

BUILDERS PROVIDENCE
Instruments

Instruments for recording, indicating, and controlling flow, liquid level, pressure, and weight. Chlorinizers — chlorine gas feeders.

Remove 4 Bolts . . .

and there's the impeller!

MORRIS
Type R
SLURRY
PUMP

No need to disconnect the piping!

Morris Type R is the slurry pump whose impeller can be removed without disturbing the suction and discharge piping or the bearings! To get at the impeller and renewable shaft sleeve, you simply loosen four outside clamping bolts — slip them out of disc slots — take off the end cover. Impeller unscrews from shaft threads; shaft sleeve is removed through end cover opening.

At no point do you have to dismantle the piping. Lay-up time costs are less . . . pump is back in service quicker.

Use the Morris Type R in Your Chemical Operations

Morris Type R is the product of 88 years' experience in designing and building materials-handling pumps. It is specifically engineered to handle mixtures containing abrasive solids and chemicals in suspension, including acid slurries and sludges and slurries containing soda ash, ore concentrates, tailings, slag, etc.

Write for specifications, capacities, performance charts, and other helpful information. Ask for Bulletin 181.

MORRIS MACHINE WORKS
Baldwinsville, N. Y.
Branch Offices in Principal Cities

MORRIS Centrifugal Pumps

INDUSTRIAL NOTES, cont. . .

exclusive patent licensee in Southern California to manufacture and distribute the product.

Cleaver-Brooks Co., Milwaukee, has appointed Mason Equipment Co., Toledo, as manufacturer's representative in northwestern Ohio for the sale of its boiler equipment.

Childers Mfg. Co., Houston, has appointed two new sales and engineering representatives for its aluminum weather-proof jacketing. They are: W. M. Acker Organization, Inc., Cleveland; Jobe & Co., Baltimore.

Damascus Tube Co., Greenville, Pa., has appointed the following new sales representatives: S. E. Anning Co., Cincinnati; Denton and Anderson Co., Detroit and Cleveland; Steel Mill Products Co., Chicago; R. E. Schlendorff Co., San Francisco.

Dryomatic Corp., Alexandria, Va., has named the Philips Export Corp., New York, to handle overseas distribution of its line of fully automatic dehumidification machines.

Metals Disintegrating Co., Elizabeth, N. J., has appointed Lewis & Co., Louisville, Ky., a distributor of its metal pigments, metal powders and abrasives.

Assn. of Food Distributors, Inc. has appointed Foster D. Snell, Inc., New York firm of consulting chemists and chemical engineers, as its official laboratory.

Kessler Chemical Co., Philadelphia manufacturer of fatty acid esters, has appointed A. G. Lilla Co. of California as its agent.

Monsanto Chemical Co.'s plastics division, Springfield, Mass., has appointed Goss Coated Fabrics Corp., Los Angeles, as West Coast distributor of its Ultron vinyl film.

Warner Electric Brake & Clutch Co., Beloit, Wis., has named Wheel Service Co., St. Paul, Minn., as one of its midwestern distributors.

Dampney Co., Boston, has appointed M. H. Hilt, Inc., Fort Wayne, Ind., as sales and service representative in the area for protective coatings.

Conoflow Corp., Philadelphia, has appointed Equipment Sales Corp., Kingsport, Tenn., to handle its pneumatic control equipment in eastern and central Tennessee as well as southwestern Virginia.

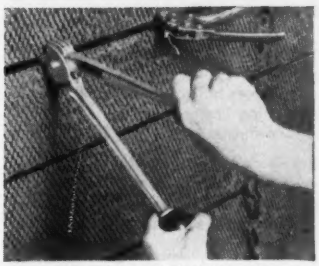
(Continued)

EAGLE PICHER Insulations

Carefully designed to fit your needs, to save you time, power, money

SUPERTEMP BLOCKS

These are efficient insulating blocks manufactured from Eagle-Picher High Temperature Mineral Wool. They derive low thermal conductivity, high refractory value, and outstanding chemical and physical stability from this basic insulating material. Weight is approx. 22 to 24 lbs. per cu. ft. Designed for temperatures up to 1700 F.

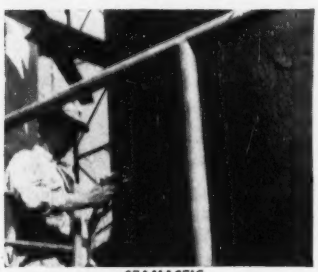


MINERAL WOOL BLANKETS

The answer to the problem of quickly and efficiently insulating flat or curved surfaces on larger types of heated equipment. Factory-made, these blankets are *certified* to meet rigid high standard specifications, offer unexcelled uniformity of mineral wool distribution. Withstand continuous exposure to temperatures as high as 1200 F. . . . offer maximum water repellence . . . resistance to steam, corrosive fumes, normal vibration.

SUPER "66" INSULATING CEMENT

A rust-inhibitive, super-adhesive insulating cement . . . offers exceptional coverage, extreme thermal efficiency. "Springy ball" structure—with small resilient pellets, each containing thousands of "dead" air cells—provides one of the most effective heat barriers known. Easily trowelled over all kinds of surfaces. Efficient up to 1800 F. . . . reclaimable where temperatures don't exceed 1200 F. Can be applied to any heated equipment.



STAMASTIC

This specially formulated weather-proofed coating forms an efficient vapor barrier . . . has strong resistance to cracking or hardening caused by temperature changes. Impervious to most acids, alkalies and chemical fumes. Heat resistant up to 300 F. Easily sprayed or trowelled over all standard types of insulation, steel, iron and other building materials.

MAXIMUM FUEL SAVINGS AND EXACT TEMPERATURE CONTROL WITH THESE EAGLE-PICHER INSULATIONS:

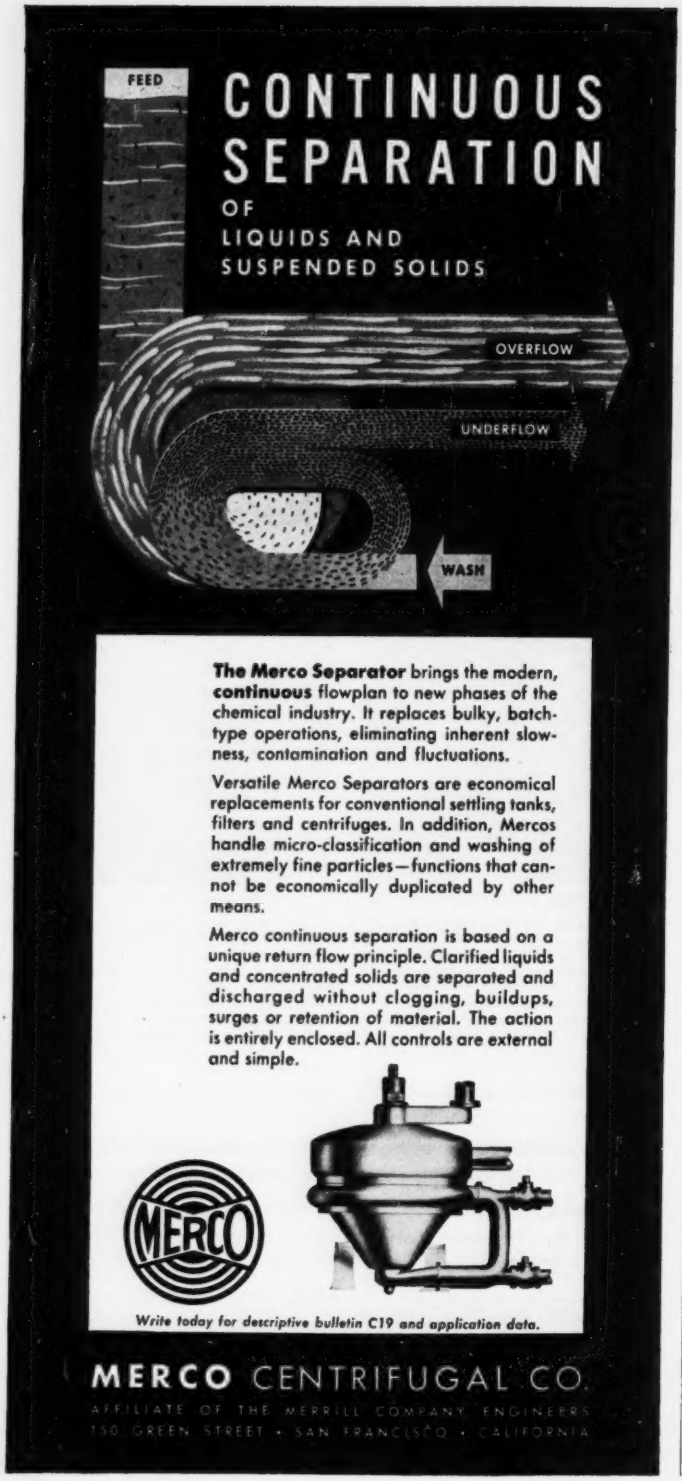
• Insulating Felts • Supertemp Block • Blankets • Loose Wool • Pipe Covering
• Stalastic • Stamastic • Insulseal • Finishing Cements • Insulating Cements
• Fireproofing Cement • Swetchek • Diatomaceous Earth Block.

EAGLE PICHER

THE EAGLE-PICHER COMPANY *Since 1843*

GENERAL OFFICES: CINCINNATI (1), OHIO

Insulation products of efficient mineral wool—for a full range of high and low temperatures. Technical data on request.


FEED
CONTINUOUS
SEPARATION
OF
LIQUIDS AND
SUSPENDED SOLIDS
OVERFLOW
UNDERFLOW
WASH
The Merco Separator brings the modern, continuous flowplan to new phases of the chemical industry. It replaces bulky, batch-type operations, eliminating inherent slowness, contamination and fluctuations.
Versatile Merco Separators are economical replacements for conventional settling tanks, filters and centrifuges. In addition, Mercos handle micro-classification and washing of extremely fine particles—functions that cannot be economically duplicated by other means.
Merco continuous separation is based on a unique return flow principle. Clarified liquids and concentrated solids are separated and discharged without clogging, buildups, surges or retention of material. The action is entirely enclosed. All controls are external and simple.
MERCO
Write today for descriptive bulletin C19 and application data.
MERCO CENTRIFUGAL CO.
AFFILIATE OF THE MERRILL COMPANY ENGINEERS
150 GREEN STREET • SAN FRANCISCO • CALIFORNIA

INDUSTRIAL NOTES, cont. . .

NEW NAMES

Bush Aromatics, a division of Dow Chemical Co., has officially changed its name to aromatics division.

American Structural Products Co., subsidiary of Owens-Illinois Glass Co., has changed its name to Kimble Glass Co. and has acquired the business and assets of Owens Illinois' Kimble Glass Division.

Roots-Connersville Blower Corp., a division of Dresser Industries, Inc., has changed its name to Roots-Connersville Blower Division.

NEW LOCATIONS

Tennessee Eastman Co. and **A. M. Tenney Associates, Inc.** have moved their New York offices to 260 Madison Ave.

Jefferson Chemical Co. has moved its executive and sales offices to 260 Madison Ave.

H-B Instrument Co. has moved to a larger more modern plant at American and Bristol Sts., Philadelphia.

Labline, Inc., Chicago manufacturers of laboratory apparatus, instruments and equipment, has moved to larger quarters at 217 North Desplaines St.

NEW LINES

American Agile Corp., Maple Heights, Ohio—Corrosion resistant plastic piping tubing and ducting for use in industry, agriculture and building.

Barber-Colman Co., Rockford, Ill.—Indicating, recording and control instrument and combustion safeguards through the purchase of Wheelco Instruments Co., Chicago.

Green Fuel Economizer Co., Beacon, N. Y.—Aerodyne dust collectors by acquiring U. S. Patent Rights from the Aerodyne Atlantic Corp., New York.

NEW COMPANIES

CEC Instruments, Inc., a subsidiary organization to handle sales and service work on instruments manufactured by Consolidated Engineering Corp., Pasadena, Calif.

St. Louis Metallizing Co., St. Louis, Mo., to offer metallizing, hard surfacing and plastic coating services. Now a subsidiary, it was formerly the metallizing division of the Nooter Corp. —*End*

Precision

aring years of Safety Head Development, S&B has accumulated the largest selection thin ductile metals in the world. These etals are controlled within .0001 of an inch ith rupture pressures ranging from 5 to ,000 PSI.

Precision

Thousands of BS&B Safety Heads are watch-dogging the safety of major industries all over America. Users are assured that the latest techniques and the best materials are used in manufacturing BS&B Safety Heads ... because development specialists carry on a continuous experimental program.

Precision

Testing, by actual rupture tests, is thorough. After any given lot of BS&B Safety Head discs have been fabricated, one out of 6 discs is selected at random and tested to destruction. Each one tested must break within 5%, plus or minus, of the rated pressure or the entire lot is discarded.

Making Sentinels of Safety...

BS&B SAFETY HEADS

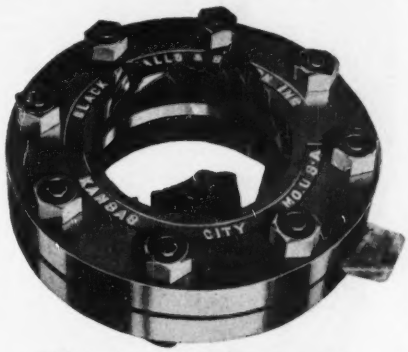
Sudden overpressure . . . and an expensive pressure vessel or piece of processing equipment is damaged – perhaps beyond repair. If that's all you're lucky. Other equipment may be lost, too...still worse, people may have been injured critically, often fatally.

A BS&B Safety Head, sentinel of safety, is designed to prevent just these things.

The Safety Head is your partner in protection. BS&B Safety Heads insure instant pressure relief when relief is most needed to save property and lives. They can be used as both primary and secondary relief devices.

There is always the possibility that other safety devices may fail...because of corrosion, clogging, or due to chemical reactions of the material handled in the vessel or line. Eliminate the gamble – with BS&B Safety Heads.

Regardless of your pressure application – air, gas or liquid – bland or corrosive, BS&B has the code-accepted Safety Head for you. Get the facts, get safety, get a BS&B Safety Head. Write for catalog giving complete details.



Wherever the Pressure is on in Industry...

you'll find top management and operating personnel interested in adequate plant and personnel protection. When that pressure results in overpressure in vessels and lines, such industries as chemical, refrigeration, power, petroleum production, processing and handling are looking to BS&B Safety Heads as the simplest, the surest, the most successful device for primary or secondary relief from critical pressures.

SAFETY BS&B HEADS

BLACK, SIVALLS & BRYSON, INC.

Dept. 2N7

7500 East 12th Street

Kansas City 3, Missouri

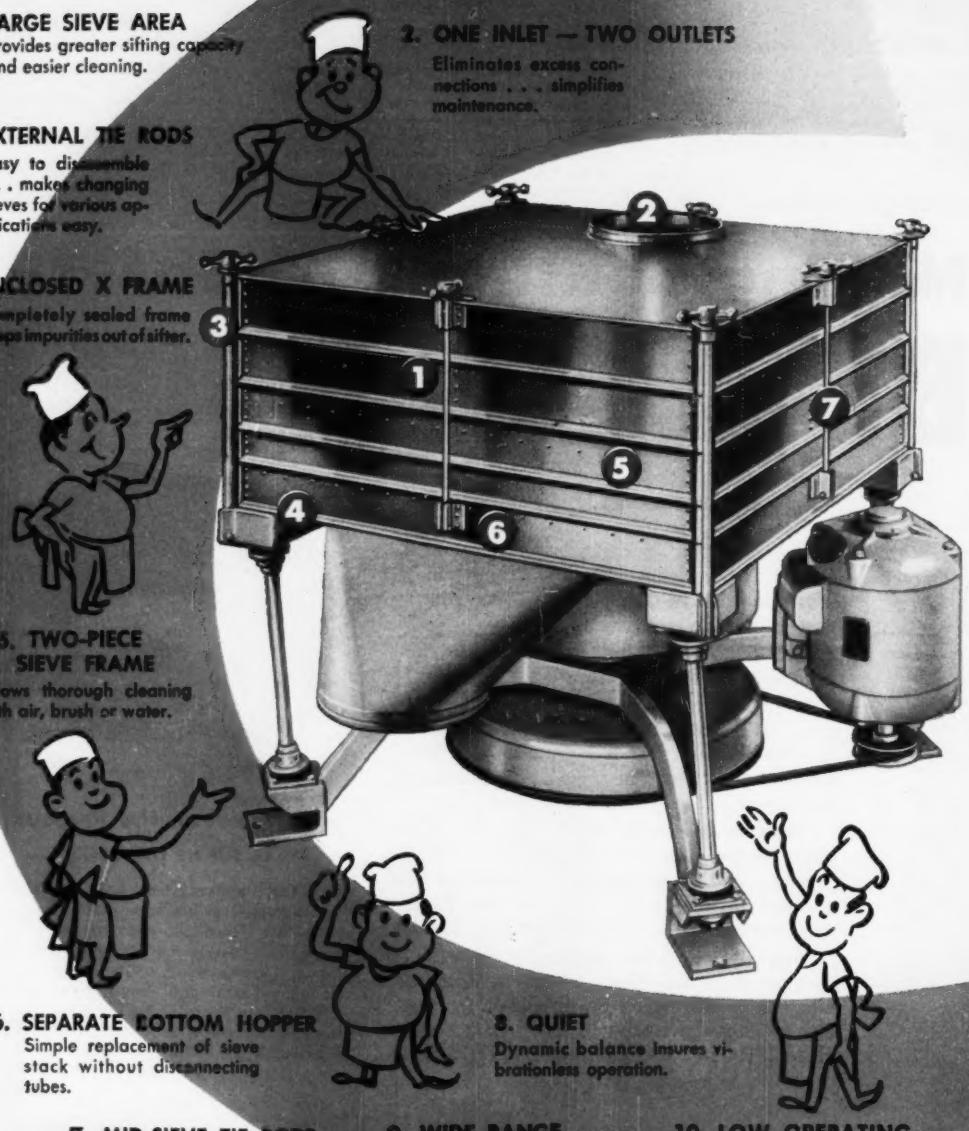
QUALITY CONTROL..

1. LARGE SIEVE AREA
Provides greater sifting capacity and easier cleaning.

2. ONE INLET — TWO OUTLETS
Eliminates excess connections . . . simplifies maintenance.

3. EXTERNAL TIE RODS
Easy to disassemble . . . makes changing sieves for various applications easy.

4. ENCLOSED X FRAME
Completely sealed frame keeps impurities out of sifter.



5. TWO-PIECE SIEVE FRAME
Allows thorough cleaning with air, brush or water.

6. SEPARATE BOTTOM HOPPER
Simple replacement of sieve stack without disconnecting tubes.

8. QUIET
Dynamic balance insures vibrationless operation.

7. MID-SIEVE TIE RODS
No product leakage — keeps floors clean. Quick product changeover.

9. WIDE RANGE
Will handle any product size from 2 to 200 mesh.

10. LOW OPERATING COST
Circle sifter requires less than 1 hp operating power.

... and lower manufacturing costs!

ALL-METAL

CIRCLE SIFTER

Streamlined Multi-Purpose

YOU'LL FIND that the versatile *Circle* Sifter is built to help solve your problems of controlling quality and lowering manufacturing costs. When you use this modern sifter for quality control, you know your product is free of foreign material. And, to help lower manufacturing costs, you get consistent, highly accurate grading on a capacity basis.

The reason behind the *Circle* Sifter's efficiency is a true gyratory sifting action. It is quiet, smooth and vibrationless . . . exposes the sifted product gently but efficiently to the maximum of screen apertures.

The *Circle* Sifter is a compact, self-contained unit . . . requires small floor space . . . little head room . . . is dust tight and is designed for quick and easy changeover from one application to another by simply changing the sieves.

Circle is an Allis-Chalmers trademark.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Chemical Milling and Processing Equipment

SEND FOR BULLETIN!

Ask any A-C representative for bulletins 0687633 and 0687625 and the complete story on the *Circle* Sifter. Or, use the handy coupon.

Allis-Chalmers
P. O. Box 512
Milwaukee 1, Wisconsin

☐ Send bulletins 0687633 and 0687625.
☐ Please have A-C representative call.

Name .....

Title .....

Company .....

Address .....

City ..... State A-3757

EDUCATING ENGINEERS

. . . *New Era*

"Many engineering colleges offer atomic physics courses for undergraduates and some have graduate courses in the engineering problems of atomic energy. Thus the engineering educator has come to the threshold of a new era."—William Allan, Dean of City College's School of Technology.

INFILTRATING TEXTILES

. . . *So to Speak*

"I can assure you that with each day the problems of the textile engineer become more complex, but at the same time, much more inspiring to creative work. This increasing complexity grows out of the fact that chemistry has, within the last 25 years, practically taken over the textile industry, so to speak."—L. K. Fitzgerald of Dan River Mills.

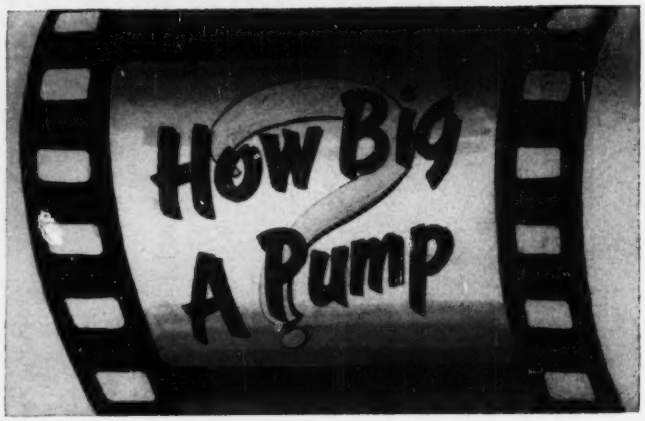
GETTING A JOB

. . . *Peak in '53*

This spring more than 250 corporations, represented by from one to six interviewers, visited Illinois Tech, anxious to meet graduating engineers. "Competition for the graduating engineer is at it's very highest in history," reports the institute's placement director, Earl C. Kubicek.

Salaries reflect the frenetic bargaining. At Tech, graduates have accepted dozens of jobs with starting salaries that average $332 per month. The price should continue to go up as selective service demands grow. Personnel men like Kubicek expect the low point in engineers will not be hit until 1953.

Oddly enough, the government has started to promote itself. "Within the past few months, government agencies, civil service as well as military branches, have entered into the competition for graduating engineers. Various civil service agencies from all over the nation are sending teams of representatives to recruit personnel in colleges. Military branches are offering the graduate an immediate rank as a line officer," Kubicek states.



Recently Allis-Chalmers produced a series of movies that, in a rather pleasant way, told the hows-and-whys of pump selection and care. This bit of dramaturgy was taken from the film, "Covering All Angles."

The cast includes . . .

JOHNNY—A young pump field man with a large imagination and small experience.

RULE—A talking slide rule who wears his obvious knowledge well.

NARRATOR—A fatherly gentleman.—EDITOR.

NARRATOR: Johnny, where do we begin when we're figuring how big a pump should be? What are the factors that determine size and horsepower?

JOHNNY: Oh, that's fairly easy. The customer tells us the capacity he wants; he gives us the specs. for his pipe system, so I can figure the head; and he tells me what he's pumping.

NARRATOR: All right. So where do we start to find out how big?

JOHNNY: I guess we start with the pipe system to figure how much head.

RULE: Good boy, Johnny. With the head and capacity known, we could select several pumps with curves that fits this requirement. These curves would show the horsepower and efficiency. But we're not ready yet to make a selection. We've got only the first leg on the answer to the question—

How Big! We always start by figuring the cold water rating, since all charts and tables for converting are based on handling cold water. With this cold water rating we can tackle anything else that determines "How Big" the pump must be.

JOHNNY: I gotcha.

RULE: Now, what other factor can effect the size or power of the pump?

JOHNNY: One factor would certainly be the weight of the liquid being pumped.

RULE: Sure, and you know how to figure it?

JOHNNY: Yep. First, find out what the specific gravity of the liquid is and simply multiply it by the horsepower required to pump cold water.

RULE: Right. Of course that would be the actual horsepower required at this rating. You may need a larger motor.

Because if the head on the system should drop for any reason, the pump would deliver a greater volume of liquid and might easily reach the point of maximum horsepower requirement—way out on the curve.

RULE: Now, we've got two parts to the answer how big. What's another factor that concerns size, Johnny?

JOHNNY: What about temperature?

RULE: Ah! Temperature! Let's call the doctor back for that one.

NARRATOR: For ordinary applications temperature and vapor pressure are inseparable, and actually make little difference to the function of the pump except on the suction side. These two factors are very simple to figure. Let's first define vapor pressure.

All liquids tend to evaporate. Some like gasoline evaporate faster than

ionXchange

pioneers and leaders in ionXchange

ILLCO-WAY "firsts" include manufacture of the first commercial two-bed De-ionizer . . . the first commercial mixed-bed De-ionizer . . . development and building of the first successful installation for beet-juice purification by ionXchange . . . and more recently the development of a similar process for the purification of crude glycerol. These and numerous other applications of ILLCO-WAY ionXchange technology are currently available for your products or processes.

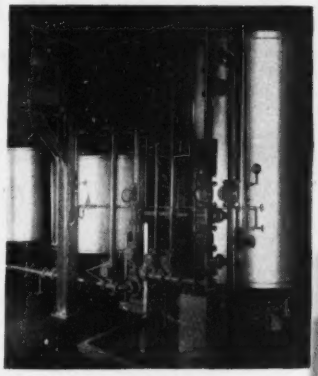
ILLCO-WAY

DE-IONIZING
DE-ALKALIZING
SOFTENING

For complete data: see Sweet's File, Engineering, or Chemical Engineering Catalog

CHROMIC ACID

Purified and reclaimed by ionXchange



Illco-Way Purifier in U. S. Government Plant improves anodic films, cuts plating rejects

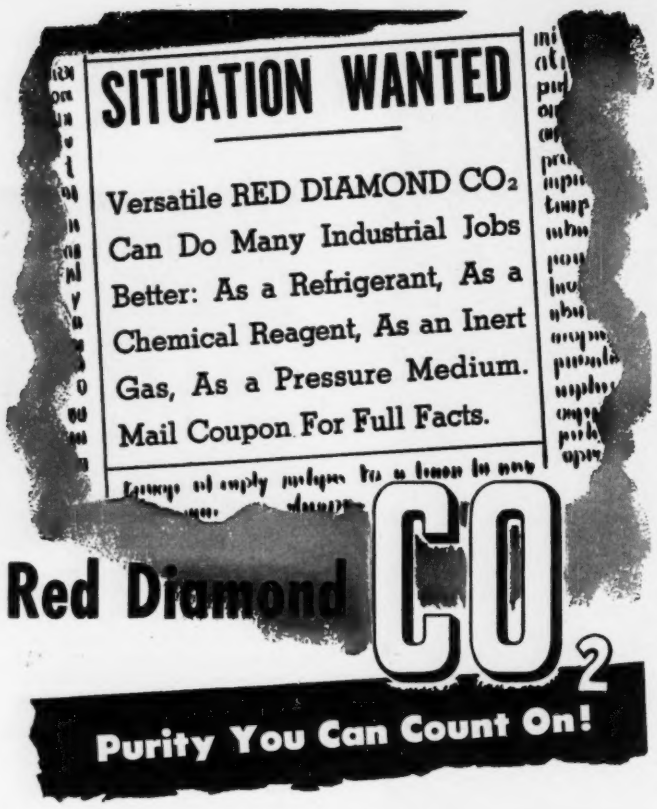
Application of ionXchange to the salvaging of critical chrome is demonstrated in the specially engineered Chrome Purifier installation (above). Equipment is used in anodizing and hard-chrome plating in a U. S. Government plant.

Purifier eliminates the necessity of discarding chromic acid and keeps contamination of anodizing solutions at a minimum. Resulting clean solution decreases voltage requirements and improves anodic films. Similarly, in chromic acid plating operations, the clear solutions produced by this method reduce current requirements, provide uniform plating, and give fewer rejects.

Mobile version of Illco-Way Chrome Purifier . . . for treatment of several solutions located throughout plants; does not take up production space, easily stored. Available in four standard sizes.

Package De-ionizers

ILLCO-WAY offers a complete line of standard (package type) De-ionizers—for the production of solids-free De-ionized water used for solution makeup, rinsing, sealing rinse after anodizing. Units are compact, shipped complete—assembled ready for immediate use. (Flow rates from 100 to 1,000 gph.) Ideal production units; convenient for laboratory and pilot-plant research. Write for Bulletin 853. Address Illinois Water Treatment Co., Rockford, Illinois.


SITUATION WANTED
Versatile RED DIAMOND CO_2
Can Do Many Industrial Jobs
Better: As a Refrigerant, As a
Chemical Reagent, As an Inert
Gas, As a Pressure Medium.
Mail Coupon For Full Facts.
Red Diamond CO_2
Purity You Can Count On!

In your own plant there are probably several operations where "Red Diamond" CO_2 can serve you profitably. You may have overlooked these possibilities or perhaps you just haven't realized the great versatility of Red Diamond CO_2. We would welcome a discussion of your plant operations, perhaps we can show you a way to save with Red Diamond CO_2. Let's get together . . . mail the coupon today.

LIQUID ALSO PRODUCES oxygen, acetylene and other industrial gases.

CO_2 in all its forms by Liquid Carbonic

GAS • LIQUID • SOLID (DRY ICE)

WORLD'S LARGEST PRODUCERS OF CO_2

A National Network of Service

Please have one of your engineers see us to discuss applications of Red Diamond CO_2.

THE LIQUID CARBONIC CORPORATION
155 East 44th Street, New York 17, N. Y.

*Individual*_____

*Firm Name*_____

*Street Address*_____ *City*_____ *State*_____

QED, *cont. . .*

others like water. The force which causes this evaporation is called the liquid's vapor pressure. It's a force inside the liquid itself.

When the temperature of a liquid is raised, the vapor pressure is also raised–so that the rate of evaporation increases. If it is raised high enough–two hundred twelve degrees for water at sea level–the liquid flashes into vapor.

And we know, a centrifugal pump will not pump vapor. There must always be less vapor pressure in the liquid than external pressure on it to prevent the liquid from flashing.

So the pump selected must operate with a net positive suction head that is low enough to safely handle the vapor pressure of the liquid being pumped.

Now we have three of the four factors which tell us how big a pump must be. We have the cold water head and capacity rating; we have the specific gravity and the temperature-vapor pressure conversion method. What's the last one, Johnny?

JOHNNY: Viscosity?

NARRATOR: Viscosity is right.

JOHNNY: And not too easy to figure.

NARRATOR: That depends on how much territory you try to take in, my friend.

Viscosity is something like the pretty girl on the park bench. Stick to the conventional line and you can have some fun. Try for the jack-pot and you may need a fire department to bail you out.

In figuring pumps for viscous fluids, stick to the uniform liquids. If the viscosity characteristics of the fluid are not uniform, don't try to figure for a pump without the help of someone who is well informed on problems of this kind. For pumping most oils, a fairly accurate estimate of a pump requirement can be made by the use of a simple performance correction chart. First, what is viscosity?

Viscosity as you know is a liquid's resistance to flow. It's generally measured by the time required for a specific quantity of liquid to pass through the orifice of a Saybolt viscosity meter, at a known temperature. This is called the SSU rating which means Saybolt Seconds Universal. There are of course other ways to measure viscosity.

At room temperature, clear water has a viscous rating of thirty-two SSU. Crankcase oil with a rating of 30 S.A.E. may have a viscosity of about eight-hundred SSU, a much greater resistance to flow. That's why it's harder work to pump heavy oil than water. *(Continued)*

steam trap trial shows how to increase production

FREE 60-DAY TRIAL

Prove what Yarway Impulse Steam Traps will do in your own plant. Install a trial trap. See your

Flat-work ironers in Pennsylvania laundry heat up in 15 min. with Yarway traps instead of previous 1½ hours.

West Coast Rubber molding plant cut heating cycle on presses from 15 minutes to 8 minutes by using Yarway traps.

Kettles in New England hospital kitchen reach cooking temperature in 12 minutes with Yarways instead of previous 25 minutes.

Southern textile mill gets satisfactory slasher production for first time due to faster heating-up with Yarway traps.

These 4 plants—each in a different industry—have something in common. Each installed a Yarway Impulse Steam Trap on a trial basis—and after witnessing the production-boosting results, they standardized on Yarway traps.

Experiences like these are found in hundreds of plants because Yarways are *designed* to get equipment *hot in a hurry,* and therefore into production fast.

Coupled with other Yarway Impulse Steam Trap advantages like small size, easy installation, stainless steel construction, easy maintenance and low cost—it explains why more than 800,000 Yarways have already been installed.

YARWAY

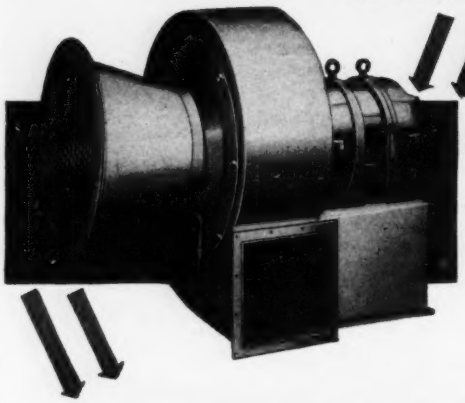
the steam trap designed with more production in mind

YARNALL-WARING COMPANY • 137 MERMAID AVENUE, PHILADELPHIA 18, PA.

SAVE TIME AND MANPOWER
REDUCE PRODUCT LOSS
DECREASE COSTS
IMPROVE LABOR RELATIONS

with the Sprout-Waldron

car loader



Loading freight cars with bulk materials need no longer be an expensive and disagreeable task. The S/W Car Loader does the job fast and economically with practically no labor and with full utilization of the car's capacity. Product loss is all but eliminated and no man is required to work inside hot, dirty boxcars.

Let your *SPROUT-WALDRON MAN* demonstrate how our Car Loader can decrease costs and help improve labor relations, or write for full details to Sprout-Waldron & Co., Inc., 15 Logan Street, Muncy, Pennsylvania.

S W MUNCY, PA.

SPROUT-WALDRON

The Best in PROCESSING EQUIPMENT *Since 1866*

245

QED, cont. . .

The effects of pumping viscous liquids are a marked increase in brake horsepower, a reduction in head and some reduction in capacity, and an extreme reduction in efficiency. So corrections from performance curves for water must be made. There are limitations in pumping conditions which can be estimated with the performance corrections chart. Here they are.

Use correction chart only for uniform liquids. Use only for pumps of conventional hydraulic design in the normal operating range. And use only where adequate NPSH is available.

RULE: And that's everything that has any effect on "HOW BIG" our pump must be. If we figure first the cold water rating, second correct for specific gravity, third correct for temperature or vapor pressure, and last for viscosity—we know exactly how big the pump must be.

PREVENTING ACCIDENTS

. . . *Incompatible Chemicals*

Recently, in an eastern university chemistry laboratory basement, four men were killed and several injured while handling sodium chlorate. A surplus from World War I, the chemical may have been contaminated by some oxidizable substance.

"Surely the storage of such quantities of hazardous substances for long periods of time in a basement along with other chemicals is hardly recommended practice," said General Electric's H. H. Fawcett at the recent annual meeting of the American Institute of Chemists in New York.

Here is a list of several incompatible chemicals prepared by Fawcett. It may suggest to you some of the many often-unappreciated reactions that occur even with small quantities.

Don't Contact These	With These
Alkaline and alkaline earth metals, such as sodium, potassium, cesium, lithium, magnesium, calcium, aluminum	Carbon dioxide, carbon tetrachloride and other chlorinated hydrocarbons. (Also prohibit water, foam, and dry chemical on fires involving these metals.)
Acetic acid	Chromic acid, nitric acid, hydroxyl-containing compounds, ethylene glycol, perchloric acid, peroxides, and permanganates.
Acetone	Concentrated nitric and sulphuric acid mixtures.
Acetylene	Chlorine, bromine, copper, silver, fluorine and mercury.
Ammonia (anhyd.)	Mercury, chlorine, calcium hypochlorite, iodine, bromine and hydrogen fluoride.
Ammonium nitrate	Acids, metal powders, flammable liquids, chlorates nitrates, sulphur, finely divided organics or combustibles.
Aniline	Nitric acid, hydrogen peroxide.
Bromine	Ammonia, acetylene, buta-

	diene, butane and other petroleum gases, hydrogen, sodium carbide, turpentine, benzene, and finely divided metals.
Calcium carbide	Water (see also acetylene).
Carbon, activated	Calcium hypochlorite.
Copper	Acetylene, hydrogen peroxide.
Chlorates	Ammonium salts, acids, metal powders, sulphur, finely divided organics or combustibles.
Chromic acid	Acetic acid, naphthalene, camphor, glycerine, turpentine, alcohol, and other flammable liquids.
Chlorine	Ammonia, acetylene, butadiene, butane and other petroleum gases, hydrogen, sodium carbide, turpentine, benzene, and finely divided metals.
Chlorine dioxide	Ammonia, methane, phosphine, and hydrogen sulphide.
Cumene hydroperoxide	Acids (organic or mineral).
Fluorine	Isolate from everything.
Hydrocyanic acid	Nitric acid, alkalis.
Hydrogen peroxide	Copper, chromium, iron, most metals or their salts, any flammable liquid, combustible materials, aniline, nitromethane.
Hydrofluoric acid, anhyd. (hydrogen fluoride)	Ammonia, aqueous or anhydrous.
Hydrogen sulphide	Fuming nitric acid, oxidizing gases.
Hydrocarbons (benzene, butane, propane, gasoline, turpentine, etc.)	Fluorine, chlorine, bromine, chromic acid, sodium peroxide.
Iodine	Acetylene, ammonia (anhyd. or aqueous), hydrogen.
Mercury	Acetylene, fulminic acid, ammonia.
Nitric acid (conc.)	Acetic acid, aniline, chromic acid, hydrocyanic acid, hydrogen sulphide, flammable liquids, flammable gases, and nitritable substances.
Oxygen	Oils, grease, hydrogen, flammable liquids, solids or gases.
Oxalic acid	Silver, mercury.
Perchloric acid	Acetic anhydride, bismuth and its alloys, alcohol, paper, wood.
Phosphorus (white)	Air, oxygen.
Potassium chlorate	Acids (see also chlorate).
Potassium perchlorates	Acids (see also perchlorates).
Potassium permanganate	Glycerine, ethylene glycol, benzaldehyde, sulphuric acid.
Silver	Acetylene, oxalic acid, tartaric acid, fulminic acid, ammonium compounds.
Sodium	See alkaline metals (above).
Sodium nitrite	Ammonium nitrate and other ammonium salts.
Sodium peroxide	Any oxidizable substance, such as ethanol, methanol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulphide, glycerine, ethylene glycol, ethyl acetate, methyl acetate, and furfural.
Sulphuric acid	Chlorates, perchlorates, permanganates.
Zirconium	Don't use water, carbontetrachloride, foam or dry chemical on zirconium fires.

PREVENTING ACCIDENTS

. . . *Worst Records*

"The blindness of the small employer—a blindness almost proportionate to his organization's smallness, it would seem—is not willful. He just does not believe you when you tell him he has a great many costly and unnecessary employee injuries," said Ned H. Dearborn, president of the National Safety Council before the recent President's Conference on Industrial Safety in Washington.

"The next time you engage in con-

NEWARK *Metallic* FILTER CLOTHS

Weaves that STOP the Solids!

Enlargements 4X

Here are five different weaves of Newark Metallic Filter Cloths. All different in the arrangement of the strands; hence different also in their functioning.

Study the shape of the solids in your solution being filtered. That's just as important as the size, if you want clarity of filtrate. Then write us fully about the solids and we'll be glad to recommend the weave of the cloth that will "stop" them.

Many malleable metals are still available so, if necessary, we can probably supply you with a material that will also withstand highly corrosive conditions. When writing, also give solution characteristics.

All Newark Filter Cloths are woven in our own plant, on our own looms, by our own skilled weavers.

Our entire line of Filter Cloths, Wire Mesh and Space Cloth, Sieves, "End-Shak" Testing Units and other Newark Products are described fully in our new Catalog D. Send for a copy.

NEWARK for ACCURACY

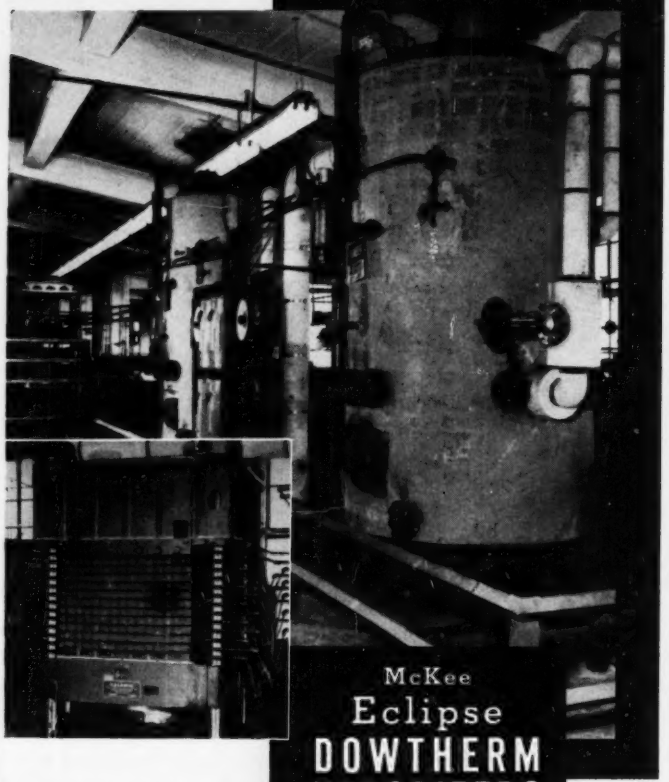
Newark Wire Cloth COMPANY

351 VERONA AVENUE • NEWARK 4, NEW JERSEY

Philadelphia 3, Penna. 1311 Widener Bldg. | San Francisco, Calif. 3180 18th St. | Chicago, Ill. 20 N. Wacker Dr. | New Orleans, La. 520 Maritime Bldg. | Los Angeles, Calif. 1400 So. Alameda St. | Houston, Texas P. O. Box 1970

WESTINGHOUSE USES ECLIPSE DOWTHERM HEATERS

to get HIGH temperatures at LOW pressures



McKee Eclipse DOWTHERM VAPORIZERS

5018

These 2,000,000 BTU Eclipse Dowtherm Vaporizers are used in operating the press shown above.

for Heating Laminating Presses

DO YOU HAVE ANY heat processing jobs in which close temperature control is a problem? Then it may pay you to take a lesson from Westinghouse and many other leading manufacturers who find the answer in Eclipse Dowtherm Vaporizers. Dowtherm's High Temperatures (up to 650 deg. F.) with Low Pressure, also eliminate direct-heat hazards, cut costs and increase safety—Investigate Eclipse Dowtherm Vaporizers. Vertical or Horizontal, 30,000 to 3,500,000 BTU; Gas, Oil or Combination. Write for Bulletin or consult SWEET'S Process Industries Catalog or Chemical Engineering Catalog.

REPRESENTATIVES IN ALL PRINCIPAL CITIES

Eclipse Fuel Engineering Company
1121 Buchanan Street, Rockford, Illinois
McKee Eclipse

THE MOST COMPLETE LINE OF INDUSTRIAL HEATING EQUIPMENT

QED, cont. . .

versation an employer of—let's say—50 people, a man who is unaware of your professional interests, I suggest you ask him about the hazards of his operations. Do it with tact, for he may resent a direct question as an implication that he does not know how to run his business.

"Lead the discussion into his first-aid setup, his arrangements for medical attention in serious cases, and make a vague reference to the fact that probably fatal accidents in his business is unknown.

"The two of you will doubtless come to the comfortable agreement that the head bookkeeper with the kit of first-aid materials does a perfectly fine job, that the amputation case of two years ago was just one of those things—the fellow admitted it was his own fault—and besides, the insurance company gets plenty to take care of that end of it.

"The man may have a frequency of 36, but the simple, deadly psychological fact is that 36 cases spread over a million man-hours in a 50-man plant are 10 years of experience, and thus the impact on the imagination of management is virtually nil.

"The human mind just doesn't hold that kind of substance in its true perspective. Consider, for instance, that the death toll of the Texas City disaster is repeated every 48 hr. in this country, but who knows it but the statisticians?

"I am willing to venture that this incapacity to absorb tragedy in great quantities is highly desirable; it is nature's method of guarding our emotional machinery.

Too keen a perception of the meaning of what goes on around us might well be the road to madness.

"The question thus resolves itself into: Who can tell the small plant manager and be believed?

"To the extent that this is true, I am saying that we need a middleman in the picture. We need a safety broker, we need a man—a whole catalog of men and agencies—who is already welcome in the front office of the smaller entrepreneur.

"That need takes us directly to local safety councils, to insurance representatives, to chambers of commerce and to on-the-ground representatives of labor departments and other government agencies who have personal contact with employers on a service basis.

"More particularly, however, the finger of opportunity is pointed at the professional and the trade associations. In them the small employer probably has greater confidence. . . The trade

a new development for users of Open Mouth Multiwalls!

BAGPAK PREFORM*

—makes bag top forming easier!
—speeds your bag closing operation!

Bag tops can be prepared for closing easier, faster and neater because of the built-in crease in Bagpak PREFORM Multiwall Bags. Bag closing operations are speeded up —and the finished package looks better!

REDUCES BAG COSTS!

In many cases, the Bagpak PREFORM crease permits bag lengths to be reduced.

SEND COUPON TODAY for full information!

E-4

INTERNATIONAL PAPER COMPANY
BAGPAK DIVISION
220 East 42nd Street, New York 17, N. Y.

Gentlemen:
Please send me full information about the new Bagpak PREFORM Multiwall Paper Bags.

NAME_____

ADDRESS_____

_____

*Trade Mark

International Paper COMPANY
BAGPAK DIVISION

BRANCH OFFICES: Atlanta • Baltimore • Baxter Springs, Kansas • Boston • Chicago • Cleveland • Denver • Detroit • Kansas City, Kansas • Los Angeles • New Orleans • Philadelphia • Pittsburgh • St. Louis • San Francisco • IN CANADA: The Continental Paper Products, Ltd., Montreal, Ottawa, Toronto

associations is his outfit; his associates in it are his folks; it is his axe that the association is always grinding."

HANDLING MATERIALS

. . . *Scotch Practise*

How to handle, with rubber belt conveyors, fertilizers that cake in hard and sharp forms?

This spring, *Chemical Trade Journal and Chemical Engineer* told how engineer J. P. A. MacDonald of Scottish Agricultural Industries, Ltd., handled the problem.

"In conveying superphosphate by rubber belt conveyor, the head, tail and snub-drums could be maintained reasonably free from accumulation by the attachment of a ¾-in. thick soft Sorbo rubber covering over the cage bars.

"Where rubber belts were used as feeders for non-pasting materials such as phospate, it was important to ensure that the opening to the belt was large enough to pass the maximum size of lump to be expected, as otherwise the belt would soon become torn to pieces wedging in the control gate.

"For this reason, it was necessary to carry a relatively deep bed of material on the belt and to control the rate of feed by varying the speed of the drive rather than by adjustment of the gate.

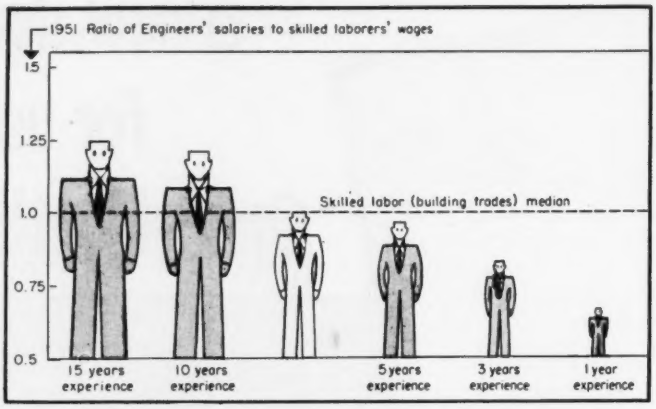
"For the handling of fine powders, totally enclosed chain conveyors of the Redler type had the advantage of being dust-free, while their ready application to inclined working was often of assistance in simplifying the layout. When there might be large lumps present in an otherwise dusty material it was necessary to consider other types of chain conveyors."

BECOMING MANAGERS

. . . *One or the Other*

Few successful managers can hope to continue at the same time as production research men, without running the serious risk of losing their grip on both jobs. As managers, they must work through others. Beyond a certain point, a man can multiply his output only through other hands and brains. The role of management in increasing that output is not always fully sensed.

——Edwin Pike in *Industrial Laboratories.*



COMPARATIVE WAGES: Springboard for recent debate. Today, median pay of engineers 5 years out of college is almost, not quite, the wages of a skilled laborer.

Must Engineers Unionize?

Graduating engineers are receiving record salaries, yet the experienced engineer is worse off today than he was 10 years ago. A move toward unionization is stirring.

Herbert Hoover said recently that "a young mechanic with three years of training, during which he is paid, can earn more take-home pay after taxes than a young engineer with six years of training and three years more of experience." Engineers today say their economic status is regrettably low. In spite of the layman's picture, trends in recent years trace disheartening lines for most engineers.*

• His comparative earnings are falling. From 1940 to 1942, the engineer with 15 years experience was getting 1.95 times the pay of skilled labor. In 1951, the 15-year engineer was getting only 1.25 times the pay of the skilled laborer. While the pay of the engineer with one year experience remains about the same, in the past 10 years, the comparative pay of engineers with 15 years experience has dropped more than 35 percent.

• His purchasing power is declining. The engineer with three years experience has today about the same purchasing power as he had in 1939, but engineers with 10 and 15 years experience have 25 percent less purchasing power.

• He has little to look forward to financially. Although the posters on the high school bulletin boards say young engineers have a splendid future, figures today show otherwise. An engineer can look forward to only 66 percent increase over his starting salary after 15 years of service.

• He is up against inequities. At times like this, when engineers are in short supply, competition from the engineering graduate is keen. Starting salaries are the highest in history, yet the experienced engineer finds himself forgotten. "There are quite a few instances of recent data in which the starting salary paid to college graduates was higher than the salary the same company was paying to engineers who had been working for them a year," says Chief Editor Nordenholt of *Product Engineering.*

In recent months, Editor Nordenholt, who believes it's "foolish to deny the existence of inequities in the salaries paid to engineers," has whipped and tugged at the conservative frock of the traditional engineer. Last month, speaking at a meeting of the ASME in Cincinnati, Nordenholt, rounded third and headed for home when he asked fellow engineers two rhetorical questions.

1. What's Being Done?—"Most of the national societies are doing something to help organize engineers to handle their employment problems.

"The American Society of Civil

* These figures are taken from curves plotted by the Seattle Professional Engineering Employees Association showing the ratio of median engineering salaries to the median of skilled labor covering 24 building trades plus three miscellaneous trades. Their figures come from the Bureau of Labor Statistics.

Engineers has done remarkably effective work in this direction and are to be credited largely for the organization of the National Professional Association of Engineers, Architects and Scientists. Organized in 1946, this association, generally referred to as the N.P.A. has already accomplished much."

The association does not supplant existing organizations or groups, but it rather serves to support and coordinate work with the group officers. "The N.P.A. has already to its credit work done for and by the Seattle Professional Engineering Employees Association which represents engineering employees with Boeing Airplane Co. This Association and Boeing have a written and signed agreement covering salaries and working conditions and recognizing the Association as the bargaining agent.

"There is a plan to form an organization called 'Unity' to speak for the whole engineering profession on all non-technical matters. The danger is that this organization, embracing 16 engineering and scientific societies or groups, including the national societies and E.J.C. will be dominated by management elements.

"The N.P.A. requested, through the Engineering Joint Council, to participate in the organization of Unity. The matter is still in abeyance.

2. What Can Be Done?—"We have in this country five great engineering societies with a total membership of more than 100,000. One might suppose that the logical organizations to look after the welfare of engineers would be these great societies.

"However these societies limit their activities to professional matters other than economic. The societies are controlled largely by men in the highest management levels of industries. It would be absurd to have these societies represent employed engineers in matters relating to engineering salaries.

"But from these societies should come the leadership and the men to organize an association, union, or what ever you may call it. . . .

"I have proposed that all costs of education shall be deductible for income tax purposes. If the cost of an engineering education, including the loss of earnings were to be amortized over a 15 year period, out of the earnings of the engineer, he would have to take $50 a month from his pay for the first 15 years out of college.

"The boys in Washington have what they think is a better idea. They would have 'the government' give away free scholarships to the tune of $50 million at the start and work that up to $150 million a year. It would be just another step along the glorious

Coated Abrasives Division

FIFTIETH ANNIVERSARY 3M COMPANY 1902 ★ 1952

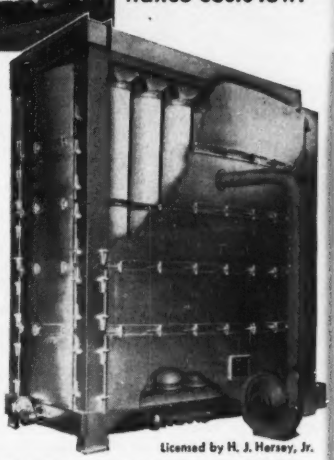
NOW SERVED BY DAY DUST CONTROL

"Meets our rigid requirements . . . Keeps our plant clean . . . Keeps our maintenance costs low."

3M Office Building

These are typical statements coming from the Coated Abrasives Division of Minnesota Mining and Manufacturing Co., St. Paul, since the installation of DAY Type "AC" Dust Filters.

Used for the recovery of abrasive materials, the DAY Filters are reclaiming abrasive dusts with better than a 99.998% efficiency. This high filtering efficiency is possible because the principle of operation in a DAY Filter permits the use of a high grade filtering felt. In addition, the other rigid dust control requirements of the 3M Company are being met.



Licensed by H. J. Hersey, Jr.

ADVANTAGES OF DAY TYPE "AC" DUST FILTERS

Continuous-Automatic Operation . . . reverse air jet rings move slowly up and down the filtering tubes, cleaning continuously.

Constant Air Volume . . . assured by back pressures leveling off after starting.

Higher Air-To-Cloth Ratio . . . 10, 15, or even 20 to 1 ratios with uniform back pressures.

Smaller Units, Less Floor Area Required . . . with no sectional shutdowns necessary for cloth cleaning, less filter is required for equal volumes of air.

Separated Dust Streams . . . several different product streams may be handled simultaneously without mixing.

EASY PLANT HOUSEKEEPING: The 3M Company also reports that these advantages make plant housekeeping easy and result in a clean plant—an aid to employee morale, high production and low plant maintenance costs.

71 YEARS' EXPERIENCE IN INDUSTRIAL DUST CONTROL

The DAY Company is proud to offer skilled engineering and service gained through 71 years' experience in the engineering, manufacture and installation of dust control systems for industry. If you have a dust problem, DAY can provide an effective and economical solution. DAY engineers are at your service for plant studies and cost estimates. CALL OR WRITE-TO-DAY FOR MORE INFORMATION.

DAY SINCE 1881

The DAY Company

856 3rd Ave. N. E. Minneapolis 13, Minn.

IN CANADA: P. O. Box 70N, Ft. William, Ontario

Branch Plants in Ft. Worth, Buffalo and Welland, Ontario

DIAMOND

"UTILISCOPE" (WIRED TELEVISION) A "PLANTER'S EYE"

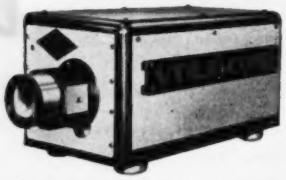
FOR MACHINERY AND PROCESS

A familiar story is that of the African planter whose native workmen stopped work as soon as he was out of sight. Finally he took out his glass eye and laid it on a stump in front of them. Believing the planter could see with the eye no matter where he was, the natives worked steadily.

The Diamond "Utiliscope" (Wired Television) provides a remote "eye" for processes too dangerous, too hot, too cold, too inaccessible, too distant, or otherwise difficult or impossible to observe directly. And it doesn't depend on anybody's superstitious beliefs. Instead it transmits a clear image of whatever is observed to a viewing screen located in any convenient place. Consequently, it saves manpower, improves product quality, increases production and prevents accidents.

The Diamond "Utiliscope" is surprisingly simple and low in cost. No special skill is needed for installation and operation. Its stability and reliability are exceptional. Ask for Bulletin 1025 which shows a wide variety of cost-cutting applications.

"UTILISCOPE" CAMERA



"UTILISCOPE" RECEIVER

TYPICAL USES—Watching flow of molten steel • Checking remote gauge readings Observing conditions inside furnaces • Viewing nuclear research • Coordinating materials flow on conveyors.

The "Utiliscope" (Registered U. S. Patent Office)

4669

DIAMOND POWER SPECIALTY CORP.

FIRST IN INDUSTRIAL TELEVISION

LANCASTER, OHIO • OFFICES IN 39 PRINCIPAL CITIES

Diamond Specialty Limited — Windsor, Ontario

Since 1903, Diamond has Manufactured Quality Equipment For Industry

WRITE FOR BULLETIN 1025C

QED, *cont. . .*

road to ruin that we have been following.

"As to the ethics involved, I have never felt that the desire for decent pay is unethical or unprofessional. Teachers, doctors and certified public accountants have their associations that deal with non-professional matters. Why not engineers?

"The most ludicrous situation I have encountered is that in the Office of Salary Stabilization. Lawyers, doctors and dentists are exempt from salary control. But employed engineers are not, and who represents them at O.S.S.? Their employers.

"It is essential for engineers to be organized in groups or associations that will be mindful of their economic status and that will represent them on matters other than professional affairs. It is inevitable that if this is not done we will see professional labor organizers who have no professional engineering interests take the leadership and through the well known tactics of such groups, force upon the employed engineers a union organization of the type that might well be, and probably would be, extremely distasteful and unprofessional and in the end unprofitable."

SCHOOLING ENGINEERS

. . . Should We Proselyte?

Barnett Dodge, who visited schools in France and Japan during the past year, recently reported that the concept of chemical engineering in these countries is quite different from ours. Actually, the do not emphasize the unit operation concept.

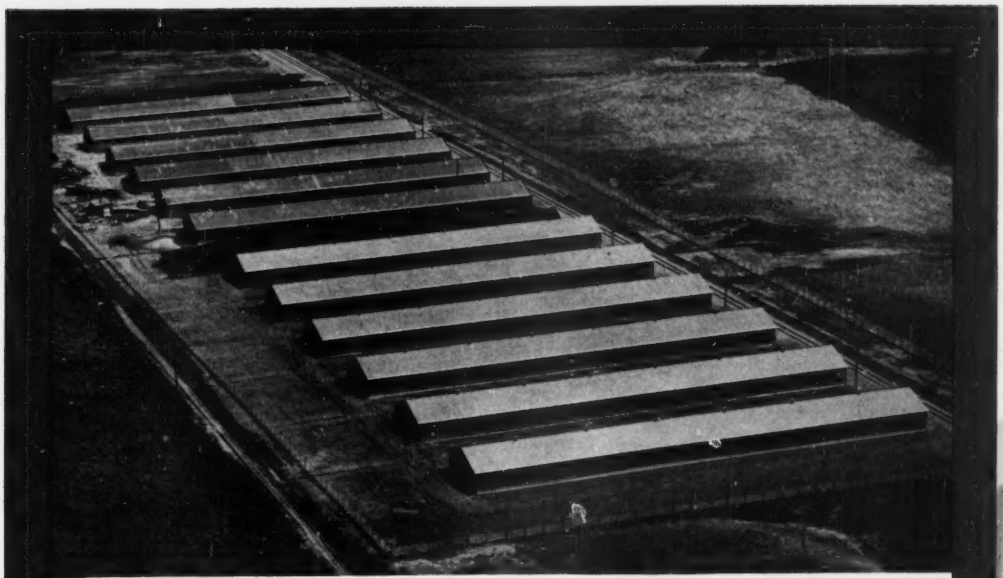
Edgar L. Piret similarly observed that "on the European continent, one can count on the fingers of one hand the educational centers giving what approaches our concept of chemical education."

Quite naturally, thinking chemical engineers are concerned. Should we rush the acceptance of our philosophy of chemical engineering education abroad, either in the interests of uniformity, or as a contribution to the development of the long-time technical and economic strength of our allies?

In a recent talk, P. H. Groggins of the National Production Authority said that we should slow down and let nature take its economic course.

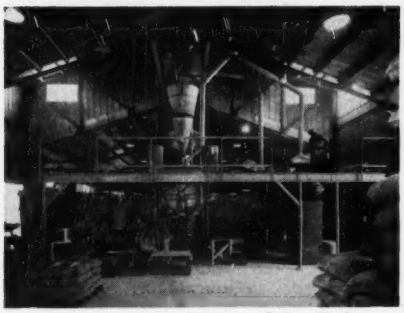
"I am not at all certain that they would appreciate our efforts or use the proffered information. The reasons for these doubts and differences of opinion are based on fundamentals.

"In the U. S., we have the greatest



DEPENDABLE, WEATHERTIGHT STORAGE for 15,000 tons of sacked ammonium nitrate fertilizer is provided for chemical company by 12 Butler Buildings, Military, Kansas.

For Warehousing or Plant Facilities Today Buy Butler Steel Buildings



FULL SPACE USE is assured by Butler Buildings used as chemical processing plant at Memphis, Tennessee.

You can get new buildings quickly when you specify Butler Steel Buildings . . . for plant expansion or new construction, for processing, packaging or storage facilities. And Butler Buildings offer these special advantages:

(1) Low cost . . . save up to 50% of the cost of building with commonly-used materials.
(2) Little maintenance.
(3) Permanent construction . . . built better to last longer.
(4) Fire-safe, weathertight, wind-resistant construction.
(5) Early occupancy . . . ready for use in days instead of weeks.
(6) Easy insulation . . . at low cost.
(7) Wide range of sizes.

Build *today* with Butler Steel Buildings. See your Butler dealer, or mail coupon below.

Straight Sidewalls . . . Use All the Space You Pay For

BUTLER STEEL PRODUCTS

BUTLER MANUFACTURING COMPANY
KANSAS CITY, MISSOURI
Galesburg, Illinois
Richmond, California
Birmingham, Alabama
Minneapolis, Minnesota

For prompt reply, address office nearest you:
BUTLER MANUFACTURING COMPANY
7338 E. 13th St., Kansas City 3, Missouri
938A 6th Ave., S.E., Minneapolis 14, Minnesota
Dept. 38A, Richmond, California

☐ Send name of my nearest Butler dealer.
☐ Send information about Butler Buildings, for use as_____

Name_____
Firm_____
Address_____
City_____ Zone____ State_____

WHY STRESS THE TERM "TAILOR-MADE"?

Because — today's filter cloth requirements in the chemical and allied fields are so complex that special service and techniques are essential

HOW DOES NFM FIT INTO YOUR PICTURE?

Because — we weave all these synthetic fibers and know the problems of handling each yarn type

Because — being able to weave as little as 100 yards of special constructions or odd widths, we can be your filter cloth 'pilot plant'

WHAT SHOULD YOU DO?

Write us about your problems on liquid or dust filtration. We'll send literature, samples and ideas gained from our long experience in serving your industry

* NFMC—T.M. applied for
** Reg. TM for du Pont's acrylic fiber

Weavers of Industrial Filter Media for over Forty Years

NFM **The National Filter Media Corp.**

General Offices & Mills: New Haven 14, Conn.
Western Office & Factory: Salt Lake City 1, Utah

Sales Offices—Representatives

Chicago, Ill.	Cincinnati, Ohio	Houston, Texas	Oslo, Norway	Johannesburg, South Africa
2627 West 19th St.	Boulevard Center Bldg.	1406 Second National Bank Bldg.	Nicolai Friis	Edward L. Bateman

industrial empire on earth. We have a wealth of raw materials, enormous manufacturing facilities and large competitive industrial establishments. Many of our chemical engineers are engaged in developing new processes which will accelerate the obsolescence of existing equipment.

"Here, it is entirely appropriate and necessary to train chemical engineering students in the design and construction of facilities as well as in their operation. It's a logical outgrowth of our competitive economy. Our curriculum should therefore include studies of both unit operations and unit processes.

"In other countries where raw material resources, construction materials, and manufacturing facilities are scarce or inadequate, there is reason to question the need of emphasis on unit operations studies. Many of these less industrially developed nations obtain a substantial portion of their chemical plant equipment from the U. S.

"From a practical viewpoint, it would appear logical that the chemical or chemical engineering curriculum of each nation would reflect its material and manufacturing resources."

MAKING EXECUTIVES

. . . *Five Questions*

1. What are the fundamental requirements of a management development program?

"It seems to me that this can be quickly summarized by saying that every company already has management development; that is, it has fundamental basic core of such an activity. Good or bad, it's there. However, it may be that a need exists for additional techniques to adequately develop its present employees. This will usually be determined when the present executive staff recognizes this need.

2. What are the get-ready steps which must precede the executive development plan?

"In the first place, there aren't any commonly-used get-ready steps which precede executive development. I do not mean, however, to minimize the importance of adequate coverage as to aims and objectives, the thorough training of staff personnel who may assist in the administration of any of the techniques, the complete and thorough grounding of the importance of the plan by all top executives, and the need for sincere and forthright desire to have any particular technique used by the top man in the organization.

3. What are the standards needed for a well rounded program?

"It depends on how large a rounded program you want; in other words, how large that circle is to be. Certainly a company will base its standards on its inventory. And that inventory most certainly will include the individual needs. Any general program for all personnel will not accomplish this.

4. Is a formal design necessary?

"It seems to me that a reasonably formal design must be in someone's mind, but there is relatively little need to force all management personnel to recognize it, especially at the start of the expanding of the central core. When executive development is such that the subordinate is being developed without the skeleton of the plan or program projecting out through the covering, the clothing, or the fat of the technique—then it's successful. Perhaps the formal design should best be prepared after the procedure has mellowed with use.

5. Are there common designs which help to administer any phase of executive development in a more understandable way?

"I wish I knew the answer to this one. You'll have to draw your own conclusions on that. I further think it's impossible to define the scope of the accepted activity, because no one person or no group of people can say which of the many developmental techniques are most important or which are musts.

"The important thing in the use of all of these development techniques is that if these techniques are to be used profitably and effectively, a specific technique must be used only on an individual who needs that technique to help him develop. In other words, tailor-make the training for the individual."

——Virgil K. Rowland of the Detroit Edison Co. before the recent meeting of the American Management Association in Chicago.

PUMPING GAS

. . . *Which Power Source?*

Two gas pipelines, one powered by reciprocating engines and another by gas turbines, recently were studied and compared in a survey made by Westinghouse. Result: A 26-in. pipeline powered with gas turbines was found to deliver the same amount of gas more economically than a 30-in. line powered with conventional reciprocating engines.

In addition, the 26-in. pipeline, required about $8 million less capital investment and 64,500 fewer tons of

AGAIN WE STRESS THE TERM "TAILOR-MADE"...

Because — NFM fabrics coupled with our cutting and sewing techniques result in made-up covers of low cost and high quality

HOW CAN NFM FIT INTO YOUR PICTURE?

By relieving you of the need of maintaining inventories of roll cloth, of sewing threads

By offering you experienced labor at rates based on volume production of element covers for all types of equipment in liquid and pneumatic filtration fields

By our two factories — New Haven and Salt Lake City — located to give you maximum service and minimum delay in shipment

WHAT CAN YOU DO?

Order a trial quantity of made-up covers for your equipment. Compare our workmanship and price with your own figures. We feel sure you'll become another customer for our "Tailor-Made" products

Weavers of Industrial Filter Media for over Forty Years

NFM **The National Filter Media Corp.**

General Offices & Mills: New Haven 14, Conn.
Western Office & Factory: Salt Lake City 1, Utah

Sales Offices—Representatives

Chicago, Ill. 3627 West 19th St. | Cincinnati, Ohio Roselawn Center Bldg. | Houston, Texas 1406 Second National Bank Bldg. | Oslo, Norway Nicolai Friis | Johannesburg, South Africa Edward L. Bateman

...FRONT and CENTER!

If you want to command the right agitating equipment for your processes, pick Nettco Engineered Agitators.

With Nettco, you can pinpoint your processing problems. Because our line of agitator drives is so extensive, you can select the exact horsepower, ratio, speed, and torque for each mixing job. This means economy of power consumption and economy of processing time.

At Nettco you can command the services of specialists in agitation. In no other field of processing are there more "surprises" and pitfalls than in agitation. Because Nettco engineers combine the practical with the theoretical . . . because each Nettco installation is based on actual field experience . . . you're sure of getting a workable, practical, efficient solution to your agitating problem, no matter how involved it may be.

May we quote on your requirements? Send blueprints and specifications to New England Tank & Tower Company 87 Tileston Street, Everett 49, Massachusetts.

NETTCO

Foremost in ENGINEERED AGITATION for over half a century

steel to build. Annual cost for the line was reduced by about $1.4 million or 0.8 c. per thousand cubic feet of gas pumped.

Right now, gas turbines should prove the cheapest and most efficient source of power for gas pipeline pumping, says Development Engineer J. O. Stephens of Westinghouse, who addressed members of the Natural Gas Association in Los Angeles at its recent spring meeting.

Unlike the reciprocating engine, the gas turbine lends itself to driving a high speed centrifugal compressor for gas compression, Stephens explained. A new concept in this field, the centrifugal compressor operates more efficiently at lower pressures than a reciprocating type compressor, permitting closer station spacings. As a result, the annual delivery capacity for a gas turbine powered line is substantially greater.

MAINTAINING FILTER PRESSES

. . . *Try Aluminum*

For many maintenance men, filter press plates are a rusty pain in the neck. Manufacturers know that cleaning and painting plates is a never-ending, expensive and time-consuming task. By no means a new problem, maintenance engineers have been taking advice on care-of-a-filter-press for half a century.

Last month, *Ceramic Industry* added its counsel to the swollen stream of knowledge . . .

1. Of the paints, an iron oxide base paint appears to give the best service, and has a life of about a year. After two or three cycles of cleaning and repainting, have the entire surface of the plate sand blasted down to clean metal before repainting. This is a somewhat costly operation, but should pay for itself in faster filtering.

2. Some people feel porcelain enamel is the ideal finish. Although the initial cost of enameling would be about 10 times the cost of painting—for example, a Chicago area dry process enameler estimates that enameling would cost about $13 a plate—a manufacturer could expect to gain a minimum of 5-10 years of maintenance-free use from the enameled plates.

3. For metallizing, zinc appears to be the best coating; it costs about five times the cost of cleaning and painting, and has a life of about five years.

4. If electroplating, a copper coating with a thickness of 0.001 in. is recommended. Cost of this coating,

Accidental Thermal Shock?

...THERE'S NOTHING FRAGILE ABOUT

Lapp TUFCLAD

SOLID Chemical Porcelain ARMORED with Fiberglass-Reinforced Plastic

Now you can gain the advantage of solid chemical porcelain purity and chemical resistance in a system which offers extra protection to personnel, equipment and product. Lapp TUFCLAD armor—multiple layers of Fiberglass fabric impregnated and bonded to the porcelain body with an Epoxide resin of high strength and chemical resistance—cushions accidental blows, insulates against thermal shock. Besides, it is itself tough and strong—will hold operating pressures against gross leakage, even if porcelain is cracked or broken. WRITE for description and specifications on Lapp TUFCLAD porcelain valves, plug cocks, safety valves, flush valves, pipe, fittings and special shapes.

Lapp Insulator Co., Inc., Process Equipment Division, 506 Maple St., Le Roy, N. Y.

Lapp

PROCESS EQUIPMENT

CHEMICAL PORCELAIN VALVES • PIPE • RASCHIG RINGS

PULSAFEEDER CHEMICAL PROPORTIONING PUMPS

costly corrosion checked!

Saran Rubber at Work

These large cation and anion exchangers regenerate the ion resin in a 10% concentration of hydrochloric acid. Ordinary linings pulled out and cracked at the flanges. There has been no difficulty since saran rubber was installed 23 months ago.

with SARAN RUBBER tank Lining

Industries handling, storing or transporting corrosives can lower operating costs and increase the life expectancy of costly equipment by installing saran rubber tank lining. The high degree of both chemical and abrasive resistance makes saran rubber an outstanding lining where resistance to grease, many solvents, acids and other chemicals is required.

Saran rubber can be applied easily, effectively and economically by experienced tank lining applicators located strategically throughout the country. Get in touch with an applicator today by contacting your nearest Saran Lined Pipe Company office.

for tank cars
storage tanks • tank trailers
processing tanks
production tanks

RELATED PRODUCTS

Saran rubber molded parts—stoppers, diaphragms, various-sized moldings for valves, instruments, etc.

Saran lined steel pipe—corrosion-resistant pipe that gives long-term operation with minimum maintenance.

Write to the Distributor:

SARAN LINED PIPE COMPANY

2415 BURDETTE AVENUE • FERNDALE, MICHIGAN

Offices in: New York • Boston • Pittsburgh • Tulsa • Philadelphia Chicago • Portland • Indianapolis • San Francisco • Houston • Denver Los Angeles • Seattle • Cleveland • Charleston, S.C. • Toronto • Montreal

clip and send today!

Saran Lined Pipe Company
2415 Burdette Avenue, Ferndale, Michigan

Please send me your catalog on Saran Rubber Tank Lining and Saran Rubber Molding Stocks.

Name_____ Title_____

Company_____

Address_____

City_____ State_____

908

QED, cont. . .

including the cost of sand blasting and pickling prior to plating, is about 5 times the cost of painting.

5. Cadmium plating is perhaps the ideal plating material for cast iron. It apparently fuses with the base metal, has less chance of body contamination, gives much more satisfactory service. Cost of cadmium plating will run about twice the cost of copper plating.

6. Try aluminum press plates.

ADJUSTING FOR DEFENSE

. . . *Industrial Dispersion*

From the Executive Office of the President, the National Security Resources Board offers, in a recently published question and answer guide, counsel on industrial dispersion.

Q. Does the industrial dispersion program call for the dispersal of all types of industrial plants?

A. No, the industrial dispersion program calls only for the dispersion of new and expanding defense-supporting industrial plants.

Q. Does the national dispersion program call for moving established industry?

A. No, it is designed to disperse only those new plants and expanding industrial facilities required for defense purposes.

Q. Would a community of less than 200,000 population be able to locate a defense plant within its borders?

A. Yes; unless the area is, for other reasons, a prime target for atomic attack.

Q. What distances from potential atomic targets are recommended under the national industrial dispersion policy to assure a reasonable measure of security?

A. New industrial areas generally should be 10 to 20 miles from any densely populated or highly industrialized section of an urban area, major military installation, or other critical facility, and should be located where transportation, manpower and utility facilities are readily accessible. Topographical conditions and use of protective construction may vary this requirement.

RECOVERING METALS

. . . *New Manganese Process*

Near the end of 1948, United States importers of manganese were informed that in the future Russian exports would be reduced to token

shipments. In a survey of potential domestic sources, American Iron and Steel Institute discovered that an estimated 772,000 net tons of metallic manganese are contained annually in open hearth slags—more manganese than the steel industry purchases for consumption in a year.

Quickly recognizing a potential domestic source, the institute started investigations to find methods to recover manganese from slag. Right now, three different processes—a blast furnace, ammonia leaching and a chlorine process—are being evaluated.* Of the three, chemical engineers seem most interested in the chlorine process, which uses both pyrometallurgical and chemical techniques for recovery.

Now under investigation at Illinois Tech, this process treats slag with either solid or gaseous chorides (anhydrous calcium chloride or HCl gas) at a temperature that will cause volatization of iron and manganese chlorides and leave behind all gangue material.

How It Works: Hydrogen and chlorine are generated by the electrolysis of brine and conducted to a reactor. The two react exothermically, and it is anticipated that enough heat will be produced to supply that needed for the process.

Slag, ground to pass a 28 mesh screen, enters the top of the reactor. At a temperature of about 950 deg. C., volatile manganese and iron chloride are swept into a condenser by the circulating gases. Small scale tests indicate that about 80 percent of the iron and manganese are volatilized by the HCl in an amount equal to twice the stoichiometric equivalent for these two metals.

Condensed chlorides then pass to a chlorinator where they are treated with chlorine gas. At temperatures of 350 deg. C. and higher, ferrous chloride is converted to ferric chloride and volatilized while the manganese chloride is unaffected. The separation is complete and rapid.

Volatilized ferric chloride is condensed and treated with hydrogen from the electrolytic cells. Hydrogen chloride is recovered, and a high purity iron powder is produced.

Excess gas from the reactor contains a large amount of water as a result of reaction between the reducible oxides in the slag and hydrogen. When gases are cooled, water condenses, forms hydrochloric acid with excess HCl in the gas mixture.

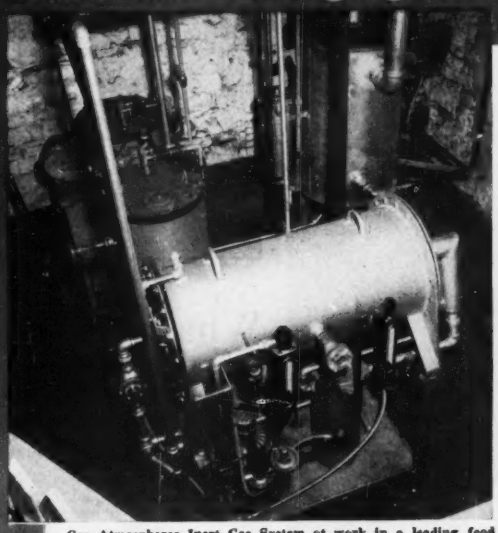
This acid, along with that formed in the condenser, must be subse-

* See Shadburn Marshall's paper read before the General Meeting of American Iron and Steel Institute at New York, May 21-22, 1952.

GAS ATMOSPHERES

Inert Gas Generators

Slash Food Packaging Costs . . .



Gas Atmospheres Inert Gas System at work in a leading food plant. Note compactness of this high production system that includes generator, dryer and trace oxygen removing equipment.

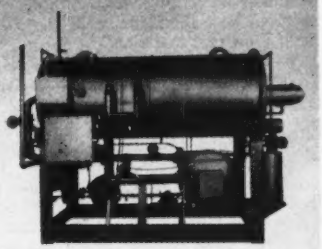
Machine also lowers cost of line purging and blanketing . . .

Eliminating headspace oxygen from canned goods can now be performed easier and at less cost than ever before. Gas Atmospheres Inert Gas Generators, thoroughly tested by leading packers, produce products at less cost, and of better color and flavor by eliminating headspace oxygen to less than 1%.

Gas Atmospheres Inert Gas Systems work in less floor space and at less cost than any other method.

For chemical use, too, Gas Atmospheres Inert Gas equipment cuts costs of purging, blanketing, etc., to new lows.

Get all the facts before you buy. Find out about the amazingly compact, explosion-proof, low cost Gas Atmospheres Inert Gas Systems today. Write for Bulletin I-552.



For more complete information write for Bulletin number I-552

gas Atmospheres, inc.

equipment for producing industrial gases

20005 WEST LAKE ROAD CLEVELAND 16, OHIO

QED, *cont. . .*

quently electrolized to recover the valuable chlorine. If such a process works efficiently, the only material consumed would be hydrogen equivalent to the reducible oxides in the slag. Such perfection is, of course, too much to expect.

Interesting as the process is, engineers will want to ask some difficult questions. For instance, how are you going to electrolyze HCl; or, what materials of construction will you use for chlorine at these high temperatures?

Goodyear's Dinsmore

Polymers For Oil Masterbatching

PROCESSING RUBBER

. . . *Research Going On*

Fortunately, research is continuing in oil-extended synthetic cold rubber, and promises for further progress are good, Vice President R. P. Dinsmore of Goodyear told English rubber men at a recent meeting of the Institution of the Rubber Industry in Wolverhampton.

In particular, the new tough synthetic Alfin rubber has shown great promise in recent experiments. Its dynamic properties are superior to those of cold rubber and approach those of Hevea. Reports state that it is the most resilient of all polymers of high molecular weight.

Making Alfin, using conventional methods, would be difficult. However, the polymers are well adapted to the oil masterbatching process, a recent Goodyear development.

In the Alfin process, polymerization is carried out in a hydrocarbon solvent, usually pentane. After polymerization processing oils are added and thoroughly incorporated before evaporation of the solvent.

In this way 100, or even 200, parts of oil per 100 parts of polymer can be added. This gives an oil-masterbatch that processes freely.

The oil can be added to the polymer after it has been isolated, or it can be added with the monomers as a partial or total replacement for the solvent prior to polymerization.

From acetylene you can get . . .

1. Acetaldehyde
2. Acetylene Black
3. Tetrachloroethane
4. Vinyl Acetylenes
5. Vinyl Acetate
6. Ethylidene Diacetate
7. Vinyl Chloride
8. Acrylonitrile
9. Acetone
10. Ethylene
11. Butinediol
12. Propargyl Alcohol
13. Cyclooctatetrene
14. Acrylates
15. Vinyl Amines
16. Vinyl Ethers

What You Can Do With Acetylene

After 35 years in business, acetylene producers ask, whither and whence acetylene. They see many new applications and several technological improvements.

This spring, H. S. Sutherland, vice president of Shawinigan Chemicals, Ltd., spoke to members of the International Acetylene Association at a general meeting in Indianapolis on the "Chemical Uses of Acetylene." His talk is the basis of this QED feature article.—EDITOR

1. ACETALDEHYDE

Acetaldehyde is produced by the addition of water to acetylene. The original process, which did not work well, was patented in Germany and developed into a workable process in Canada during World War I. Since that time many improvements have been made, and production has been increased both in Canada and the United States.

The process: High-purity acetylene is circulated through a reaction vessel containing mercury sulphate and dilute sulphuric acid. Approximately 25 percent of the acetylene is converted to a acetalydehyde per pass at very high yields. The acetaldehyde is recovered by condensation and water scrubbing and the acetylene is recirculated.

Aqueous acetaldehyde is distilled to produce a product of 99 percent purity. The process has stood the test of time; probably because it gives a large through-put and dissipates the large heat of reaction easily.

Acetaldehyde is used as the principal raw material in the manufacture of synthetic acetic acid, acetic anhydride, ethyl acetate, and crotonaldehyde. These, together with their derivatives such as butyl alcohol, butyl acetate, butyraldehyde, octyl alcohol, dioctyl phthalate, vinyl acetate, and vinyl acetal resins, form the basis of a large organic chemical industry.

Acetylene does not stand supreme in the manufacture of acetaldehyde. Ethyl alcohol, either fermentation or synthetic, and natural gas compete with it. The economics of the various processes depend on the location of the raw materials and location of the markets.

2. ACETYLENE BLACK

Acetylene black is produced by the thermal decomposition of acetylene. It is a form of pure carbon with somewhat of a graphitic structure, and whose outstanding properties are high electrical conductivity and high liquid absorption.

These properties make it a desirable material for use in the manufacture of dry cells. Long self-life batteries, developed over the last twenty years, can be attributed in no small part to acetylene black. It is also used in making conductive rubber and conductive flooring.

3. TETRACHLOROETHANE

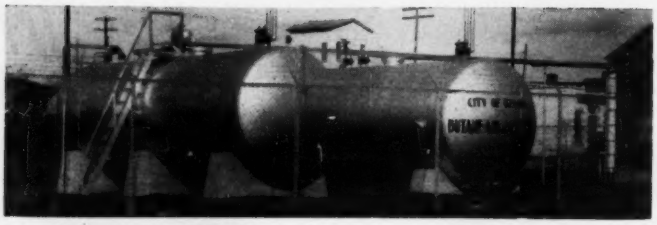
Chlorine and acetylene in the daylight will react with explosive violence. But, under properly controlled conditions, chlorine can be added to acetylene almost quantitatively with high yields to produce tetrachloroethane.

This material on distillation with lime splits off hydrogen chloride to

YOU CAN CUT CONTROL VALVE INVENTORIES *in half!*

ONE ANNIN VALVE BODY FOR THREE TYPES OF ANNIN OPERATORS

A single Annin valve body is standard for use with any of three types of Annin operators. Furthermore, each size of operator fits two sizes of valve bodies. Think how your inventory of critical control valves can be cut: For any installation the valve body is selected by size and alloy, then assembled with operator desired, and your control valve is complete (positioner unit built-in)—ready for service under specified conditions. In addition, all valve bodies carry a 1000# rating. Interchangeable flanges series 15, 30 and 60 are split-ring mounted to meet any requirement. Write today for detailed information. Ask for Catalog 1500B.



TANKS and vessels that are CORRECT in design

● Whatever your needs in pressure vessels—gas storage tanks, pressure spheres, creosoting cylinders, bubble towers, gas scrubbers, etc.—you can depend on Cole for tanks that are correct in design and permanently leak-proof at the welded or riveted joints.

We also design and fabricate elevated tanks, acid tanks, dye vats, digestors, standpipes, storage tanks, etc.

Write for latest Cole catalog—*"Tank Talk."*

Established 1854

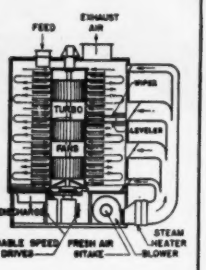
R. D. COLE MFG. CO.
NEWNAN, GEORGIA

ELEVATED TANKS • VESSELS • CYLINDERS
TOWERS • BINS • STANDPIPES

the CONTINUOUS Turbo-Dryer® VERTICAL, TRANSFER TYPE

for GRANULES • BEADS • POWDERS
CRYSTALS • PASTES • SLUDGES • SLURRIES

DRYING
COOLING
SUBLIMATION
OXIDATION



combines
gentle handling
uniform drying
dustless operation
high efficiency

with
low power
reduced space
low maintenance
low dust losses

Available in packaged unit for pilot plant and small production.
Field erected units up to 25,000 lb. evaporation per hour.

TURBO DRYER

WYSSMONT COMPANY
DRYING ENGINEERS
31-06 Northern Boulevard • Long Island City 1, N. Y.

QED, *cont. . .*

produce trichloroethylene, the well-known degreasing solvent and dry cleaning fluid. Further alternate chlorination and de-hydrochlorination will produce a range of chlorinated solvents including perchloroethylene and finally the white solid hexachloroethane, which is used as the principal element in smoke bombs.

4. VINYL ACETYLENES

As a result of Father Nicuwland's work, vinyl acetylene (together with divinyl acetylene) was made from acetylene using a copper chloride—ammonium chloride — hydrochloric acid catalyst. The Du Pont Company was quick to see the possibilities in this compound, and by the addition of hydrogen chloride produced chloroprene—the monomer for neoprene. The process was developed commercially in the early 1930's.

5. VINYL ACETATE

When acetylene and acetic acid react, the initial product is vinyl acetate. The original vinyl acetate process is similar to the acetaldehyde process except that the water is replaced with acetic acid. Modern vapor phase processes are now in operation; they use zinc acetate catalysts.

Vinyl acetate, a liquid, will easily polymerize under certain conditions. It is the raw material for the well-known polyvinyl acetate resins and polyvinyl acetate emulsions. From polyvinyl acetate are derived polyvinyl alcohol and the range of polyvinyl acetal, butyral and formal resins which have wide use in moulding, safety glass interlayer and electrical insulation.

6. ETHYLIDENE DIACETATE

Along with the production of vinyl acetate by the mercury catalytic method, there is produced a high-boiling substance, ethylidene diacetate. It is a combination of one mole of acetylene with two moles of acetic acid. The process may be varied to produce a preponderance of either ester.

Ethylidene diacetate can be broken down by heat and catalysts to produce acetaldehyde and acetic anhydride. This process was developed by Rhone Poulenc in France, and was used extensively by the Du Pont Company in the United States for many years as their source of acetic anhydride. It has recently been supplanted by cheaper methods of manufacture.

7. VINYL CHLORIDE

Vinyl chloride was originally produced by the decomposition of ethylene dichloride, a byproduct in the

ethylene glycol industry. In this decomposition, hydrogen chloride is set free. To use it up, the reaction between hydrogen chloride and acetylene was worked up to a commercial scale. Today a large amount of the vinyl chloride in North America is produced by the vapor phase reaction of acetylene and hydrogen chloride.

8. ACRYLONITRILE

Acrylonitrile, a newcomer to the family of acetylene-derived chemicals, is one of the main raw materials for the manufacture of the new fibres Orlon, dynel, and Acrilan.

On this continent acrylonitrile has been manufactured from ethylene oxide. In Germany it is manufactured by the direct addition of hydrogen cyanide to acetylene. This German process, apparently more economical, is likely to be adopted in one way or another by many North American producers. The process, similar to the chloroprene process, uses copper catalysts.

9. ACETONE

In its early stages, the acetaldehyde process turned out acetone, like so: acetylene—acetaldehyde-acetic acid—acetone. Later a process was developed to produce acetone directly from acetylene and steam. Hydrogen and carbon dioxide are byproducts.

This process has been used in Germany, France and Canada for many years. It must now be considered obsolete in North America, but possibly can still compete in Europe. The process uses zinc oxide and iron oxide catalysts and the acetylene is converted in a single pass with moderately high yields.

10. ETHYLENE

On this continent it might appear silly to manufacture ethylene from acetylene. Nevertheless, in locations where ethylene is scarce, it is done and the economics are right. Acetylene and hydrogen will combine over a palladium catalyst to produce ethylene with very little ethane and little residual acetylene. The ethylene is, of course, used as a source of ethylene glycol or polyethylene.

11. BUTINEDIOL

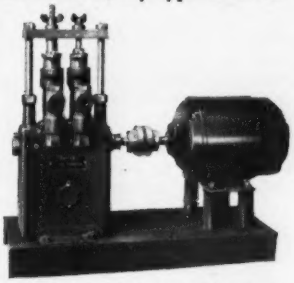
Butinediol was manufactured in Germany during the last war by passing acetylene and formalin over a copper acetylide catalyst at elevated pressures. The reaction is carried out at about five atmospheres at 90-110 deg. C., and one mole of acetylene combines with two moles of formaldehyde.

One of the problems in the manufacture of butinediol is handling acetylene at elevated pressures. One

Chemical feeding Problems ?

FOR THE ANSWER ASK Manzel

MULTI-FEED CHEMICAL FEEDERS ... Manzel flexibility permits accurate feeding of many different chemicals simultaneously. Chemicals can be pumped into other liquids or test samples drawn from production at regular intervals. Easily synchronized with any process. Supremely accurate proportional feeding. Any number of feeds, any type of drive.



LARGE OR SMALL CAPACITIES ... Manzel Chemical Feeders pump from a fraction of a drop to 60 gph per feed... with unsurpassed accuracy and dependability. You eliminate troubles due to guesswork, inaccuracy, or forgetfulness.

324 BABCOCK STREET
BUFFALO 10, N. Y.

Specializing in High Pressure Metering Pumps Since 1898

Despite their time-tested dependability, Manzel Chemical Feeders are priced much lower than you might expect. They can be individually engineered for most applications. Write for details today.

Deming "MOTOR-MOUNT" Condensation Return Units (above and at right). Single and Duplex units for 2,000 to 40,000 sq. ft. of radiation.

Deming Fig. 4958 Centrifugal Jet Units (below) for 500 to 10,000 sq. ft. of radiation.

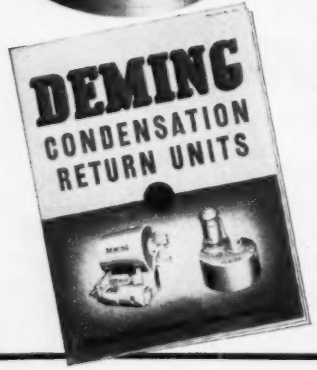
● These modern, efficient "fuel-savers" return the condensate from steam coils, radiators, or steam operated equipment back to the boiler.

Deming "Motor-Mount" centrifugal pumps are used on Deming "Motor-Mount" Condensation Return Units. Pump motors have standard "NEMA" type "C" mounting flange and are furnished for single phase, two or three phase or for direct current, as specified.

"Motor-Mount" pumps are equipped with enclosed type bronze impeller and stainless steel pump shaft. Deep stuffing box is provided with conventional packing rings for grease lubrication.

Deming Fig. 4958 "Hotshot" Condensation Return Units are equipped with a centrifugal jet pump. Entire pumping unit and jet can be removed for cleaning without disturbing any of the piping.

Ask your Deming Distributor or write us for illustrated Bulletin No. 4400 which includes performance tables to simplify selection of proper unit to meet specific requirements.



THE DEMING COMPANY
525 Broadway • Salem, Ohio

QED, *cont. . .*

solution: use suitable diluents and keep the size of pipes and tubing below critical limits. As an additional precaution the equipment is designed to withstand pressures considerably in excess of anticipated decomposition pressures. In spite of all precautions taken, it is reported that numerous decompositions accompanied by loud noises, occur in the reaction vessels.

Butinediol was used as a starting material in the manufacture of butadiene for synthetic rubber. It was first hydrogenated to butanediol, which was then dehydrated to produce first tetrahydrofurane (an interesting compound in its own right) and then butadiene. In Germany, the Ludwigshaven plant produced 21,500 tons of butinediol per year.

12. PROPARGYL ALCOHOL

Propargyl alcohol is a byproduct found in the manufacture of butinediol. Produced from one mole of acetylene and one mole of formaldehyde, this triple bonded alcohol has, as yet, no commercial use. But because of its interesting reactive groups will, no doubt, find its place.

13. CYCLOOCTATETRENE

One of the most interesting achievements in Germany on acetylene chemistry is the polymerization of acetylene to cyclooctatetrene: Acetylene under pressure is a solvent (tetrahydrofurane) and in the presence of nickel cyanide polymerizes to give a number of cyclo olefines, particularly cyclooctatetrene. The reaction is carried out at 80 deg. C. and 20 atm.

The practical applications of cyclooctatetrene are speculative. But it does provide a source of long chain dibasic acids, as well as a wholly unexplored series of compounds containing eight carbon atom rings.

14. ACRYLATES

Acetylene can be made to react with carbon monoxide and water in the presence of nickel carbonyl to produce acrylic acid. In the presence of alcohols, the corresponding esters are produced. The recent work in Germany never got past the laboratory state, but it shows an intriguing possibility of a new route to the acrylates and polyacrylates.

15. VINYL AMINES

In the presence of catalysts, acetylene under pressure will combine with both primary and secondary amines. One of the compounds produced, vinyl carbazole, may be polymerized. It finds some use in the electrical insulation field.

TYPICAL WIGTON-ABBOTT SERVICE IN THE PROCESS ENGINEERING FIELD

DEVELOPMENT OF A NEW PROCESS

Assign your process problem to Wigton-Abbott. Whether it is the manufacture of a new product or the improvement of your present process, Wigton-Abbott engineers will solve it with the experience gained in many fields of process manufacturing. From a study of the requirements — through design and operation of a pilot plant — to development of the data necessary to construct a full-scale plant, Wigton-Abbott is equipped to take the entire problem off your hands. This is one phase of the 5-point service to the chemical industry offered by the Wigton-Abbott Corporation — a service available separately or as part of an overall project.

● *Yours for the asking*

"Packaged Plant Construction" Reading time, only 10 minutes— but it will save you many hours by answering basic questions.

DESIGN AND CONSTRUCTION FROM PILOT PLANT DATA
PROCESS DESIGN FROM CLIENT'S FLOW SHEET
THE DEVELOPMENT OF A NEW PROCESS
ECONOMIC SURVEYS AND ANALYSES
CONVERSION OF EXISTING FACILITIES

Wigton-Abbott Corporation

DESIGNERS...ENGINEERS...CONTRACTORS...PLAINFIELD, NEW JERSEY

heart of the strainer

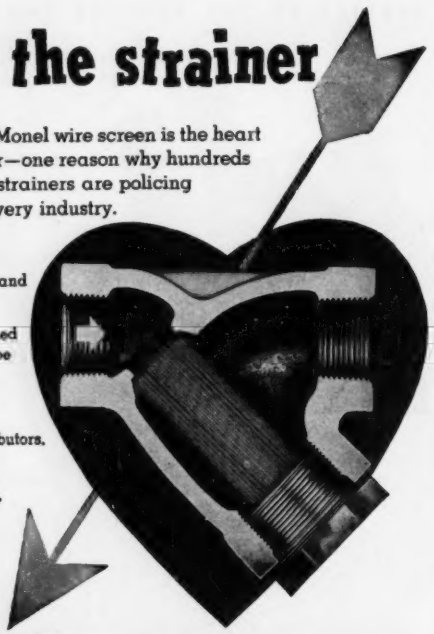
A high-grade, woven Monel wire screen is the heart of the Yarway Strainer—one reason why hundreds of thousands of these strainers are policing pipe lines in nearly every industry.

OTHER REASONS—

- cadmium plated bodies and screen caps
- straight threads, machined faces and spark-plug-type gaskets on screen caps
- ten sizes from 1/4" to 3"

Sold by 216 industrial distributors. Write for Bulletin S-203.

YARNALL-WARING CO.
137 Mermaid Ave.
Philadelphia 18, Pa.



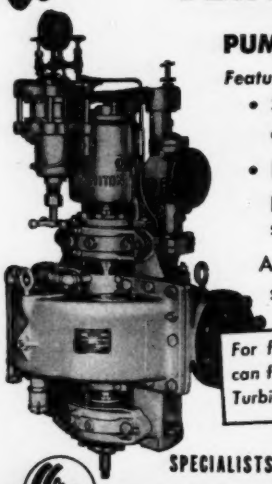
YARWAY STRAINERS

Whiton SOLID STEEL ROTOR

VERTICAL TURBINES

Economical—Dependable . . . for

PUMPS • FANS • COMPRESSORS



Featuring:—

- SOLID STEEL ROTOR . . . gives high efficiency for low-speed, direct drive.
- LABYRINTH SHAFT SEAL . . . positively prevents leakage. Eliminates wear and seizing.

Available in various types and frame sizes up to 600 Horsepower.

For full information on how Whiton Turbines can fill your requirements, write directly to our Turbine Division.

SPECIALISTS IN HORIZONTAL AND VERTICAL TURBINES.

WHITON MACHINE CO.
NEW LONDON 14, CONN., U.S.A.

QED, cont. . .

Vinyl pyrrolidone, another interesting compound, is made by the reaction of acetylene under pressure, anhydrous pyrrolidone and potassium hydroxide. Yields are reported to be reasonably high.

During the last war, Germany produced 60,000 lb. of vinyl pyrrolidone per month. The substance may be polymerized and its products, in dilute aqueous solution, used as a synthetic blood plasma. Work on such processing is going on in the United States today.

16. VINYL ETHERS

Vinyl ether production, perhaps one of the most fruitful developments in acetylene chemistry, came out of Germany during the past war. These ethers have long been known, but the development of their uses has been hindered by the difficulty in their production. Continuous processes have now been worked out for the reaction of acetylene under pressure with various alcohols. They use a wide range of catalysts.

The aliphatic vinyl ethers may be polymerized into useful resins or may be copolymerized with other monomers such as vinyl chloride. Among the aromatic vinyl ethers is vinyl ether of para tertiary butyl phenol, which when polymerized produces a product extremely useful as a binder of synthetic rubber to fabrics.

As a general source of aliphatic chemicals, acetylene is by no means supreme. Geography and its relation to available raw materials plays a great part in determining sources. Historically, acetylene as a raw material has usually been able to meet the competition. Where acetylene-derived processes have become uneconomical, their places have inevitably been filled by new processes. The new processes, although producing different products, have needed acetylene, and acetylene alone, as one of the reacting materials.

DISCOVERING NEW USES

. . . *Polymers or Dimers*

The first organic compound which caused loss of hair in human subjects and experimental animals alike was discovered accidentally during World War II. In the polymerization plants where chloroprene was being converted to neoprene, hair loss among the workers was traced to volatile cyclic intermediary polymers or dimers of chloroprene.—*Semi-Annual Technical Meeting, Society of Cosmetic Chemists.*

ARSENAL ECONOMY

. . . *Tendency to Yawn*

"Nobody now considers it remarkable that the United States should be spending . . . more than $1.5 billion a year on the development of atomic energy," reports London's *Economist*.

"There is a tendency to yawn over the revelation that deliveries of military supplies and construction have now reached a rate of $2 billion a month. Production of aircraft, tanks, artillery and so on is already five times what it was during the first three months of the Korean war; but that is taken for granted too.

"Mr. Truman suggested that the way in which the basic capacity of the United States to produce has increased is 'perhaps the most amazing thing about our economic progress.' The word amazing should no doubt be used carefully and infrequently, but the President seems to be well entitled to employ it here even though almost nobody in America shows much outward sign of amazment at what is going on."

OBERVING TRENDS

. . . *Short Aeon*

How much has industry grown in the U.S. since the end of World War II?

"There has been an extraordinary business outlay for new plant and equipment between 1945 and 1951 —$117 billion. The outlay for manufacturing concerns alone has totaled $54 billion. It is reassuring to know that 40 percent of our current stock of fixed capital is less than six years old, a fact of the utmost significance in connection with our production possibilities." — *Secretary of Commerce Charles Sawyer.*

FIRE PREVENTION

. . . *Smoke Detection System*

Engineers of Walter Kidde & Co., Inc., working with consulting architects, had worked out a smoke detection system. In Sept. 1951 they put it to work in the huge Nottingham filtration plant in Cleveland.

Since then the system has been on the lookout for fires started by activated carbon stored in the administration and chemical buildings. In its Feb. issue of *Kidde Industry*, the company told how it works.

Comprised of a network of pipes throughout hazard spaces, the system

IMPERVITE
HEAT EXCHANGERS
SPECIAL:
24 2" ID x 6' Impervite Tubes
STANDARD: 7 1" ID x 9' Impervite Tubes
ALL SIZES—ALL PURPOSES
STANDARD—TWO PASS:
24 ⅞" ID x 9' Impervite Tubes
SPECIAL—TWO PASS:
38 ⅞" ID x 9' Impervite Tubes
Impervite Shell
ALL CHEMICALLY IMPERVIOUS
SPECIAL: 222 ⅞" ID x 9' Impervite Tubes
SPECIAL: 148 ⅞" ID x 9' Impervite Tubes
At the Chicago Show: Don't Miss Falls' New Chemically Impervious Pump
Falls Industries, Inc.
AURORA ROAD SOLON, OHIO

FOR LESS THAN $500
YOU CAN SOLVE YOUR
SMALL PRODUCTION PROBLEMS
WITH THE MODEL G5S

Prater Pulverizer, Model G5S with motor, coupling and base

PRATER PULVERIZER

LUMPY CHEMICALS, SOAP, GLUE and many other materials can be reduced to uniform granulation in this Model G5S Prater Pulverizer! Low in price . . . compact and sturdy in structure . . . it does an economical, efficient job on low-volume grinding. Built with the same high standards of quality and workmanship as larger Prater models.

5 to 7½ horsepower. Write for details and prices.

PRATER PULVERIZER COMPANY
1517 So. 55th Court, Chicago 50, Ill.

PRATER

BREAKAGE
COSTS MONEY...

STANDARD CONVEYORS
CAN AID YOU TO REDUCE IT

Put conveyors to work moving cases, cartons, packages, parts, units through manufacturing or processing to storage or shipping. Speed handling operations — reduce breakage — increase safety — save manpower, time, and costs.

An experience record of more than 45 years, serving all classes of industry and business, qualifies Standard to be of expert service to you on any "package" conveyor need — roller, belt, slat, chain, push-bar, sectional, portable self-contained units — spiral chutes — pneumatic tube systems. Write—Address Dpt. CM72.

STANDARD CONVEYOR COMPANY
General Offices: North St. Paul, Minnesota
Sales and Service in Principal Cities

Write for valuable reference bulletin No. 308 — address Dept. 000.

QED, cont. . .

continuously takes air samples into centrally located testing mechanisms. Should a sample contain smoke, both visual and audible alarms are sounded. And the space sending the smoke sample is pointed out.

To complement the smoke detecting system, a heat detection apparatus was also installed at strategic points. An unusual temperature increase at any point causes thermostats to signal a central control station, and sound an audible alarm.

ABATING POLLUTION

. . . *Organic Question*

Do synthetic organic chemicals behave like domestic sewage?

According to Charles B. Lamb and George F. Jenkins of Carbide & Carbon, who presented the results of recent experimental work before the Seventh Purdue Industrial Waste Conference, they do not. "Within the limits of accuracy of presently available methods, many compounds show little or no B.O.D. even when incubated for periods as long as 50 days, when inoculated with settled sewage," they say.

"We can state the following on the basis of our laboratory results:

1. "Synthetic organic chemicals are not attacked biochemically in the same manner as sanitary sewage, when present in ordinarily detectable amounts.

2. "River water may not be a reliable source of seed or dilution water for the B.O.D. determination.

3. "Acclimated seed is better than settled sewage for determination of the B.O.D. of synthetic organic chemicals.

4. "The use of a standard in the B.O.D. determination apparently cannot be relied upon with synthetic organic chemicals.

5. "It may be necessary to run the B.O.D. determinations for more than 5 days in order to estimate possible pollution by synthetic organic chemicals."

SALES

. . . *Engineer's Role*

Today, and particularly in the near future, the chemical industry will have to find a tremendous new market for its increased output.

"The job is frankly too big for any one segment of the industry to tackle alone," admitted Sales Promotion

10 years of operating experience

means

RELIABILITY

UNIT RATING
16,000 Amps for 50-200 V.
8,000 Amps for 200-400 V.

obtainable only with the

BROWN BOVERI MECHANICAL RECTIFIER

- ***The ELECTRO-CHEMICAL INDUSTRY*** can now have the benefits of UNPRECEDENTED EFFICIENCY, LOWER POWER BILLS and TROUBLE FREE OPERATION.
- NO MAINTENANCE, NO REPLACEMENT OF CONTACTS with unity load factor at D.C. Voltages up to 400 Volts.
- STABILITY and LONG LIFE EXPECTANCY OF CONTACTS made possible by:
  1-The use of proper alloys.
  2-The exclusive Brown Boveri Thyratron shunt circuit which KEEPS THE COMMUTATION CURRENT EXTREMELY LOW and provides for a LOW RATE OF RISE OF VOLTAGE across the break DURING COMMUTATION.
- IMMEDIATE RESUMPTION OF SERVICE AFTER ARC-BACK due to disturbances in the A.C. supply system. A super-fast contactor (1/10 of one cycle) protects the contacts and can be RESET AUTOMATICALLY an indefinite number of times without maintenance.
- AUTOMATIC ONLOAD VOLTAGE REGULATION within very wide limits.
- A QUICK, SELF-LIQUIDATING INVESTMENT because of the POWER SAVINGS IT MAKES POSSIBLE.

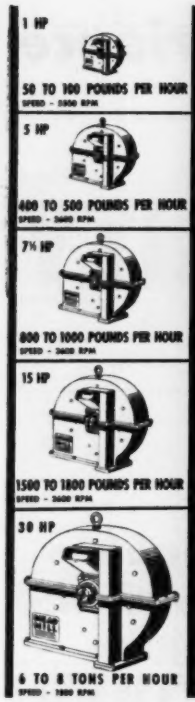
It will pay you to investigate this BROWN BOVERI Mechanical Rectifier.

FOR COMPLETE DATA, MAIL COUPON TODAY!

Brown Boveri Corp., 19 Rector St., N. Y. 6
Please send me data on Mechanical Rectifiers.
Name..... Title.....
Company.....
Address.....
.....

BROWN BOVERI

BROWN BOVERI CORPORATION
19 RECTOR STREET, NEW YORK 6, N. Y.


1 HP
50 TO 100 POUNDS PER HOUR
5 HP
400 TO 500 POUNDS PER HOUR
7½ HP
800 TO 1000 POUNDS PER HOUR
15 HP
1500 TO 1800 POUNDS PER HOUR
30 HP
6 TO 8 TONS PER HOUR

MEAD IMPACT MILLS
SINCE 1877

PULVERIZE
GRINDABLE AND UNGRINDABLE MATERIALS

FAST CONTINUOUS PRODUCTION
QUIET
LOW MAINTENANCE
5 VERSATILE MODELS
WIDE RANGE of MATERIAL & PARTICLE SIZES
HIGH SPEED IMPACT

WET or DRY SAMPLES of YOUR MATERIAL TEST RUN *at no charge.*

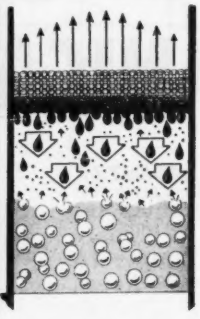
PATENT PENDING
COMPLETE ENGINEERING AND INSTALLATION AVAILABLE

Write for literature...
MEAD MILL COMPANY
14620 EAST SEVEN MILE ROAD
DETROIT 5, MICHIGAN • DREXEL 1-0200

ARE YOU BOTHERED BY ENTRAINMENT?

Look into METEX MIST ELIMINATORS

...and see how they will help boost production and cut costs



Removal of liquids entrained in gases is simple . . . economical . . . effective —when you use Metex Mist Eliminators! As the mixture passes through the Mist Eliminator, the entrained liquid is wiped out and retained by the extensive KNITTED wire area—until it coalesces into drops that are large enough to fall back through the rising flow. The gas passes on—freed from entrainment.

Efficiencies 95% or better • Little if any pressure drop • Can be installed in existing equipment • Made of practically any metal • No moving parts

Worth looking into, isn't it? Ask for your free copy of "Metex Mist Eliminators", an 8-page brochure that's packed with facts. Or write us about your specific entrainment problem.

METAL TEXTILE CORPORATION
KNITTERS OF WIRE MESH FOR MORE THAN A QUARTER CENTURY

METEX

661 East First Avenue Roselle, N. J.

QED, *cont.* . .

Manager E. D. Kennedy of Monsanto.

"Every one . . . must accept his share of the job and no one group of individuals can contribute more than engineers," he told the recent conference of the Society of Plastics Engineers in Chicago.

Enlarging on the engineer's share, Kennedy further commented:

"The role of engineering in selling is to encourage sound applications and to steer away from the unsound.

"In many fields appearance is important. The engineer must accept as part of his responsibility the job of making the product look right as well as making it work right. Good appearance is one of the big advantages of just about all of the plastics, and the engineer should help the sales force by taking full advantage of it.

"The biggest teamwork job that the engineer can do today with the sales force is the selling of pride of material.

"The engineer, more than any one individual in the industry, can sell pride of material. The engineer recognizes the limitations of plastics materials, but he is just as conscious of their good qualities. He knows that the universally perfect material is yet to be found. Glass breaks—iron rusts —wood rots—gold and diamonds cost too much—all materials have their negative side."

ENAMELS

. . . *Is it the Shape?*

"If the jerk that made this thing had to enamel it, he would have used a little more horse sense."

According to George Greene of South Western Porcelain Steel Corp. the enameler often has just complaint. Shape has a lot to do with successful enameling.

"Even flat letters, numerals, or neon sections are often so poorly designed that regardless of how carefully they are processed, it is difficult to avoid tearing and chipping in handling.

"This of course is no problem to the fabricator. If it bends or kinks, he hammers it straight again. But if in the dry bisque it is bent even a little, tearing is sure to develop in the firing operation and chipping will generally result at such a weak point.

"So without going into detail about poor welding, bad finishing, double thicknesses or sharp corners, may we conclude by saying that a poorly designed shape can cause the enameler a lot of worry and trouble."—*Ceramic Industry*, May 1952.

EXTRUSION

. . . *Disposable Raincoats*

Marvinol VR-10—the highest molecular weight general purpose vinyl chloride in use—extrudes smoothly and rapidly. Recently Naugatuck Chemical Division, U. S. Rubber Co., put on display at the National Plastics Exposition its new one-thousandth-of-an-inch-thick vinyl plastic film—a tough, transparent film, processed by blow extrusion and based on Marvinol VR-10.

Blow extrusion, which has been used for years on polyethylene films, had failed for vinyls until Naugatuck developed its process. Last January at the eighth Annual Technical Conference of the Society of Plastics Engineers, Naugatuck's Albert M. Stover told how the process works.

Extrusion equipment includes premixing units for feed, extruder with film-blowing head, take-up units for rolling up film and die-dismantling units. If excessive heat starts an autocatalytic reaction releasing HCl gas, die-dismantling takes the equipment apart in a hurry.

In processing, an extruded tube, inflated slightly with air, is sealed at its upper end by squeeze rolls. Additional air, introduced through the die, slowly expands the tube to an even diameter. Air sealed in between nip rolls keeps expanding the film as it comes from the die.

Film thickness is changed by changing the speed of the take-up rolls. Film is extruded at 394-425 deg. F., which is higher than calendering heats and explains increased tensile. Usual formula is 100 parts resin, 30-45 parts dioctyl phthalate plus other additives.

At film thickness as low as three ten-thousandths of an inch and widths exceeding 100 in., one pound of raw material can turn out 50 sq. yd. of film. Water-proof, dust-proof and grease-proof, the film will probably be used initially for industrial packaging. Other possible uses would be: disposable raincoats and disposable garbage pail liners.

PERSONNEL

. . . *New Rating Systems*

Management has never really been satisfied with the traditional merit rating system in which one or more bosses rate the employee. Lately, psychologists have been trying to work out new systems.

At the recent personnel conference of the American Management Association in Chicago, Joseph Tiffin of the Division of Education and Applied

Perhaps the most interesting feature of this Duraspun High Alloy Casting is that four different sizes of centrifugal castings are involved. These vary from 34" to 3½" in diameter. Sections, outlets, collar bands, lugs etc., were all welded together in our shop to form the retort as you see it in the picture. Assembled weight runs around 7,464 pounds.

High alloy castings is our business—not merely the adjunct of an extensive steel founding business. We have the experience—30 years in the static casting division and 20 years on centrifugal castings. We pioneered both kinds for castings in this country. And we have excellent testing and checking facilities, including a 400,000 volt X-ray machine and gamma-ray units.

If you would like this combination of wide experience, modern shop practice, up-to-date equipment and full testing facilities working on your next high alloy casting, bring it to us.

THE DURALOY COMPANY

Office and Plant: Scottdale, Pa. · Eastern Office: 12 East 41st Street, New York 17, N.Y.

Atlanta: J. M. TULL Metal & Supply Co. · Detroit: W. D. NAZLETON 855 New Center Building · Chicago: F. O. NELSON 332 S. Michigan Avenue · San Francisco: JOHN D. FENSTERMACHER 1241 Taylor Street

METAL GOODS CORP. Dallas · Denver · Houston · Kansas City · New Orleans · St. Louis · Tulsa

SILICATE SERVICE FOR CHEMICAL BUYERS

how silicates can serve you

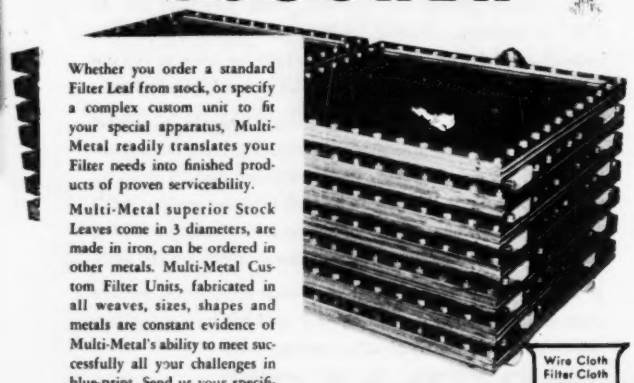
PQ Silicates are alkaline and colloidal and offer a convenient, economical source of soluble silica as a base for innumerable reactions with acid chemicals such as calcium chloride, bicarbonate of soda, sulphuric acid, chlorine, ammonium sulphate, carbon dioxide, alum.

Choose from 40 products ($3Na_2O.2SiO_2$ to $Na_2O.3.75SiO_2$). Write for more information and for any samples for laboratory tests.

PQ Silicates of Soda
METSO DETERGENTS

PHILADELPHIA QUARTZ COMPANY
1125 PUBLIC LEDGER BUILDING PHILADELPHIA 6, PA.

MULTI-METAL
likes its Filter Unit problems
TOUGHER



Whether you order a standard Filter Leaf from stock, or specify a complex custom unit to fit your special apparatus, Multi-Metal readily translates your Filter needs into finished products of proven serviceability.

Multi-Metal superior Stock Leaves come in 3 diameters, are made in iron, can be ordered in other metals. Multi-Metal Custom Filter Units, fabricated in all weaves, sizes, shapes and metals are constant evidence of Multi-Metal's ability to meet successfully all your challenges in blue-print. Send us your specifications and ask about our helpful catalog.

★

Wire Cloth in Fabricated Units or by the roll and the cut piece

Wire Cloth
Filter Cloth
All Meshes
All Metals

Multi-Metal
WIRE CLOTH COMPANY, INC.
1350 Garrison Ave., New York 59, N. Y.

QED, cont. . .

Psychology at Purdue described three new and promising rating systems.

First system, the result of military research conducted during the last war, provides descriptive statements or phrases arranged in groups of four statements per block. The rater is asked to check two of the four statements, the one most descriptive of the man rated, and the one least descriptive.

Only certain questions count. And a scoring key available to the raters provides ratings supposedly free of favoritism. However, a trained psychologist at times may have to score more difficult ratings.

Second system, used by the Air Force during and after World War II, is known as the critical incidents technique. The method has a supervisor keep records of his employees reaction at critical incidents on the job.

For example, a machine breaks down: A typical unsatisfactory answer would be: "I saw the man beat his machine with a hammer . . ." This method, according to Tiffin, would probably be more acceptable to organized labor than any other type of merit rating.

Third system, an adaptation of a method from psychological experimentation, is the paired-comparison method. Each employee is paired with every other employee in his work unit or department.

Each pair of names is printed on a separate card. The supervisor goes through the deck, and on each card checks the name of the man who is doing the job the best. When all pairs are checked, the man having the most checks automatically gets the highest rating.

DEVELOPMENT

. . . *Three-Ring Circus*

Where does development begin? Traditionally, applied research ends when work at the laboratory bench is over. When the work graduates into the tub and bucket stage, or certainly when it reaches the pilot plant stage, it has entered the development phase.

This is over-simplified, said Lauren Hitchcock addressing a seminar meeting of the Virginia-Carolina Chemical Corp.

"It is based upon a simple sequence of steps, that is, a straight line series. I can show you books where the ideal procedure is listed in an orderly column of numbered steps. At this point let the engineering department in on the secret; a little later you

YOU get Versatility with ESSO SOLVENTS

Esso Solvents are being used more and more in a great many different industries such as—paint—textiles—rubber—chemicals—food packaging—leather—many others—where *versatility* plus dependability is required.

YOU CAN DEPEND ON ESSO SOLVENTS FOR

- **VERSATILITY**—dependable quality for a wide range of uses.
- **ECONOMY**—closely-controlled quality assures constant, efficient industrial processing, high-quality products.
- **UNIFORMITY**—made in modern refineries from carefully selected crude oil sources.
- **CONTROLLED EVAPORATION**—available in a wide range of evaporation rates with precise characteristics to meet your requirements.
- **SOLVENCY**—Esso aliphatics and Solvesso aromatics cover both high and low solvency ranges.
- **MODERN HANDLING METHODS**—separate tank storage, pumping lines, tank cars and trucks are used in all Esso Solvent handling operations. Prompt, efficient delivery to your door is assured.
- **MULTI-STORAGE AVAILABILITY**—Water terminals in many industrial centers.

Controlled high quality helps produce larger profits with versatile, dependable Esso Solvents

ESSO PETROLEUM SOLVENTS

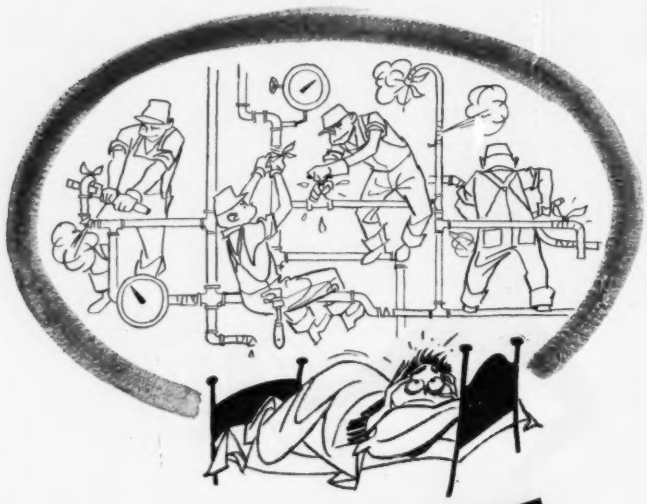
SOLD IN Me., N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Del., Md., D. C., Va., W. Va., N. C., S. C., Tenn., Ark., La.

ESSO STANDARD OIL COMPANY—Boston, Mass.—New York, N. Y.—Elizabeth, N. J.—Philadelphia, Pa.—Baltimore, Md.—Richmond, Va.—Charleston, West Va.—Charlotte, N. C.—Columbia, S. C.—Memphis, Tenn.—New Orleans, La.

FOR TECHNICAL ASSISTANCE

If you have a solvents problem or want further information on the specifications and characteristics of Esso Solvents—write or call our office nearest you. Our technicians will be glad to assist you.

Say goodbye to nightmares about pipe repairs and replacements!



Install corrosion-resistant saran lined steel pipe wherever you are piping chemicals and solvents. Because saran is extremely resistant to most chemicals and solvents, such installations will give dependable, long-term service and reduce shut-downs due to pipe repairs and replacements. In addition to minimum maintenance cost saran lined steel pipe brings you another important advantage: it is easily field fabricated. No intricate tools required, no waiting for special fabrication, no costly delays. *Saran lined steel pipe is manufactured by The Dow Chemical Company.*

install corrosion resistant **SARAN LINED** steel pipe

Write to the Distributor:

SARAN LINED PIPE COMPANY

2415 BURDETTE AVENUE • FERNDALE, MICHIGAN

Offices in: New York • Boston • Pittsburgh • Tulsa Philadelphia • Chicago • Portland • Indianapolis • San Francisco • Houston • Denver • Los Angeles • Seattle Cleveland • Charleston, S. C. • Toronto • Montreal

RELATED PRODUCTS

Saran rubber tank lining—an outstanding lining where resistance to grease, many solvents, acids and other chemicals is indicated.

Saran rubber molded parts—stoppers, diaphragms, various-sized moldings for valves, instruments, etc.

clip and send today!

Saran Lined Pipe Company,
2415 Burdette Avenue, Ferndale, Michigan
Please send me a copy of your catalog on Saran Lined Pipe, Valves and Fittings.

Name_____ Title_____

Company_____

Address_____

City_____ State_____

901-B

SARAN LINED PIPE a DOW product

QED, cont. . .

confide in the sales department; somewhat later, you disclose this bonanza to production people, ready for their greateful acceptance.

"Experience however has shown that this is highly idealized; that the whole process of making something of consequence out of a new finding does not proceed so much like a three-act play as it does like a three-ring circus. Experience has shown that the very considerable number of activities proceed largely simultaneously and in parallel, rather than one after another in Indian file."

REMOVAL OF FLUORIDES

Continued from page 211

remove foreign matter retained on the alumina, (2) forcing a caustic soda solution through the alumina, (3) following with a water and then a weak sulphuric acid rinse.

Either raw water under well pressure or treated effluent can be used for backwashing. Waste water is discharged through a sump to the sewers.

Then 5,200 gal. of a very weak caustic solution is delivered by a centrifugal pump from the caustic mixing tanks to a cross-shaped pipe grid distributor located just above the surface of the alumina. The solution passes down through the bed of sorptive particles.

The most efficient strength of caustic soda solution will have to be determined for two reasons: (1) the caustic will be recovered and reused, (2) strength of the caustic effects the fluoride removal capacity of the bed and the length of the run. There is a certain point at which the optimum fluoride removal is obtained with a given quantity of caustic. Also, the amount of caustic recovered varies with its original strength.

Next step is to rinse the alumina with water. It is during this rinsing operation that the caustic appears in the effluent from the contact tank and its recovery for use in the next cycle is carried out. When the caustic mixing tank is full, rinsing is continued in order to remove any further caustic that might be present. This additional rinse water goes to the sewer. The caustic is not strong enough to cause trouble in the Hays-process sewage treatment plant used at Bartlett.

Very dilute sulphuric acid is then passed through the alumina to neutralize any caustic that may remain in the contact tank. This wash is continued until the alkalinity of the bed approaches that of the raw water. The

water from the wells is on the alkaline side.

Output from the plant is controlled by elevation of treated water in ground storage tanks. It is done by means of a float switch which actuates the relays controlling the well pumps. When ground storage becomes full this switch cuts off the well pumps. In order to prevent the bed from draining and thus becoming airbound a diaphragm-actuated valve on the effluent line from the plant automatically closes. The valve is actuated by water pressure controlled by a float in the contact tank. If the bed becomes clogged while the pumps are operating the same float actuates a Mercoid switch which cuts off the pumps.

Cost of the equipment for this plant amounted to about $10,000.

F. J. Maier, sanitary engineer of Public Health's Division of Dental Public Health, is responsible for the processes in use at both Britton, S. D., and Bartlett, Texas. He also supervised construction and guided initial operation of both plants. —*End*

LOW DENSITY SOLIDS

Continued from page 215

ft. on a side. After hardening, it is sawed into slabs.

Foam glass is produced by Pittsburgh Corning Corp. by a method similar to the plastic chemical blowing process. Powdered glass is mixed intimately in a metal mold with chemical blowing agents and carbon black. The mold is closed, leaving enough space for expansion of the glass and is placed in a high-temperature oven. In the heated mold the glass fuses and the blowing agent decomposes to liberate gas. When the foam glass comes out of the furnace it is stripped from the mold, cooled, and later cut out to size for insulation. The uniform non-connecting cell structure and resistance to temperature extremes and chemicals make it useful for specialized insulating jobs.

Several foamed resin products are adaptable to foaming in place. The space to be filled by the foam takes the place of the mold in this process. Hollow spaces in aircraft propellers and wing structures, and spaces in boat hulls, can be filled completely to impart strength or buoyancy. Phenolic resins, or blends including phenolic resins, which are made by United Aircraft Co., General Electric and Westinghouse, are of the foamed-in-place type. The liquid resin formulation is mixed intimately with the activator or catalyst just prior to charging into the hollow space. In this application the heat necessary to cause

when you want tools fast

.... Phone your nearby Snap-on factory branch

● You'll talk to a *tool man* when you get your Snap-on branch on the wire. He'll understand your wants clearly, and help you select the most efficient tools for your needs. You'll get professional tools of the finest character — properly designed, strong, versatile, *safe*, Snap-on Tools—that will serve you long and well. For 30 years, plants—large and small—have used and endorsed this "time-saving way to buy time-saving tools." May we send you copies of the latest Snap-on Industrial and General Catalogs? Write—

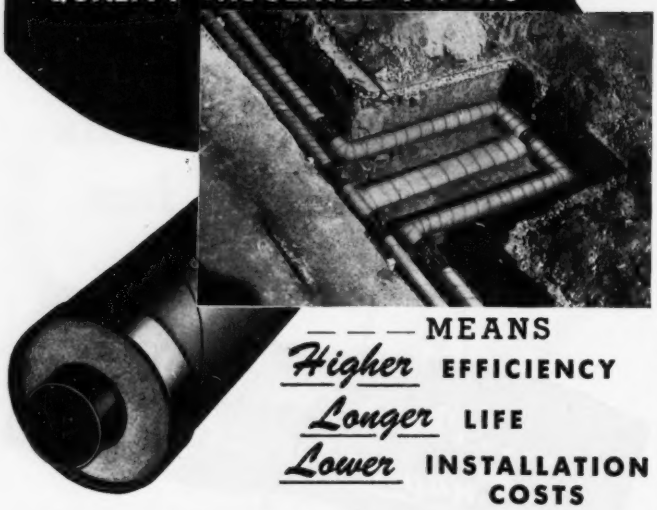
SNAP-ON TOOLS CORPORATION
8106-G 28th Ave., Kenosha, Wis.

FACTORY BRANCH WAREHOUSES IN 41 INDUSTRIAL CENTERS

Albany 5, N. Y., 546 Clinton Ave.
Atlanta, Ga., 380 Techwood Drive, N.W.
Baltimore 18, MD., 1209 E. 25th St.
Boston 25, Mass., 116 N. Beacon St.
Brooklyn 25, N. Y., 1649 Bedford Ave.
Buffalo 13, N. Y., 628 W. Utica St.
Charlotte 6, N. C., 915 S. Clarkson St.
Chicago 16, Ill., 2023 Michigan Ave.
Cincinnati 6, Ohio, 705 E. McMillan St.
Cleveland 15, Ohio, 2912 Euclid Ave.
Dallas 1, Texas, 2932 Commerce St.
Denver 3, Colo., 1050 Broadway
Detroit 2, Mich., 93 Piquette Ave.
Edmonton, Alberta, 10232 103rd St.
Fargo, N. Dak., 421 N. P. Ave.
Houston 3, Texas, 1810 LaBranch St.
Indianapolis 2, Ind., 848 Fort Wayne Ave.
Jacksonville 6, Fla., 1602 Walnut St.
Kansas City 2, Mo., 3635 Main St.
London, Ontario, 111 Mt. Pleasant Ave.
Los Angeles 14, Calif., 1717 W. 6th St.
Milwaukee 3, Wis., 2600 W. State St.
Minneapolis 3, Minn., 1218 Harmon Place
Montreal 15, Quebec, 751 Jean Talon St., West
Newark 6, N. J., 823 Sandford Ave.
New Orleans 13, La., 1040 Camp St.
New York 56, N. Y., 397 East 167th St.
Oklahoma City 3, Okla., 901 N. Hudson St.
Omaha 2, Nebr., 109 S. 24th St.
Philadelphia 30, Pa., 1710 Fairmount Ave.
Pittsburgh 8, Pa., 7007 Kelly St.
Regina, Sask., 2070 Albert St.
Richmond 20, Va., 1617 West Broad St.
San Francisco 2, Calif., 635 Golden Gate Ave.
Seattle 22, Wash., 1501 Olive Way
St. Louis 3, Mo., 2647 Washington Blvd.
Syracuse 3, N. Y., 323 Irving Ave.
Toledo 6, Ohio, 2932 Monroe St.
Toronto 17, Ont., 130 Laird Drive
Vancouver, B. C., 1043 Davie St.
Winnipeg, Manitoba, 238 Garry St.

***Foremost* IN HAND TOOL ENGINEERING, MANUFACTURE, DISTRIBUTION**

RIC-WIL
QUALITY INSULATED PIPING



— — — MEANS
Higher EFFICIENCY
Longer LIFE
Lower INSTALLATION COSTS

There is no stronger proof of Ric-wiL quality and dependability than the specification time after time of Ric-wiL Systems for heating and process distribution piping in major defense projects, industrial plants, and utility central heating systems.

Engineers like the way Ric-wiL Insulated Piping can be quickly adapted and laid out to meet any design or operating conditions. Contractors like the savings in installation possible with these 21-ft. prefabricated units, their easy handling and simple coupling features. Owners have the satisfaction of knowing that a Ric-wiL distribution system will provide high thermal efficiency, maximum protection, and long service life.

Condensate return piping and other lines subject to corrosive service may be coated with Ricwilite, a baked-on phenolic resin having outstanding corrosion resistance and durability.

Let a thoroughly experienced representative show you the installation and operating economies possible with Ric-wiL on your next insulated piping project.

RIC-WIL TYPE "B" COUPLER

Provides a watertight conduit joint with synthetic rubber gaskets. No conduit welding required, expediting joint closures.

RIC-WIL
INSULATED PIPING SYSTEMS
UNDERGROUND OR OVERHEAD

WRITE FOR . . .
Your copy of Section 480-6. Contains valuable data on pipe selection, flexibility, and expansion.

THE RIC-WIL COMPANY, CLEVELAND, OHIO
AGENTS IN PRINCIPAL CITIES
LEADERS IN INSULATED PIPING PROTECTION

PREFABRICATED INSULATED PIPING

SECTIONAL CONDUIT SYSTEMS

PREFABRICATED MANHOLES

UTILIDOR TYPE CONDUITS

blowing is generated by the fast exothermic chemical reaction.

Shell's Epon resins are foamed in place using Naugatuck's blowing agent No. 709, Celogen, and diethylene triamine as curing agent. A surface-active agent may be used to cause fine dispersion of the gas bubbles formed. The blowing action is exothermic and toluene may be used to thin the resin, absorb excess heat of reaction, and control the foaming.

The cell structure is non-connecting when the foam is properly produced. Densities as low as 1 or 1½ lb. per cu. ft. are obtainable if the foaming takes place in an oven or in heated molds.

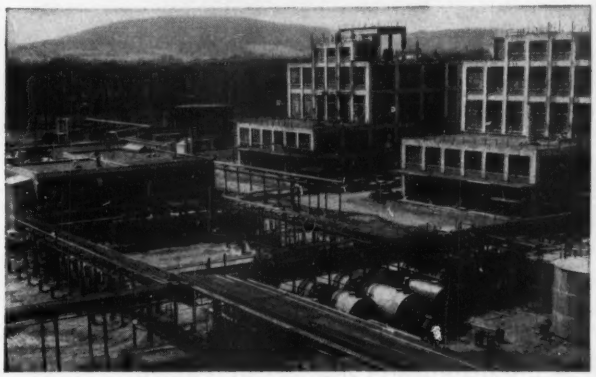
Closely related to the chemical blowing process is the blowing process in which a volatile liquid or gas is dissolved in the base liquid compound to re-expand and cause foaming when the pressure is reduced. The Dow Chemical Co.'s Styrofoam is made by this process. The expanding agent may be any one of a number of volatile solvents, such as methyl chloride. The resulting product has a density as low as 1.3 to 2 lb. per cu. ft. and is rigid and has considerable strength. This product is used for insulation, as a display material, and as a buoyant agent to prevent sinking of boats.

A foamed vinyl resin product, made from a plastisol marketed by the Elastomer Chemical Corp., employs a process developed by Elastomer using Bakelite resins. A mixture of inert gases is dissolved in the plastisol with agitation under pressure. The inert gases expand to produce foam when the liquid plastisol mixture is allowed to escape through a throttling valve. The valve discharges into molds or on to a moving metal belt. Curing is by heat in a circulating oven. The Elastomer foamed vinyl may be made batchwise in a pressure vessel agitated by shaking, or continuously in the AMF Oakes mixer, using standard gas metering equipment for the gas mixture and a positive displacement pump for metering the plastisol.

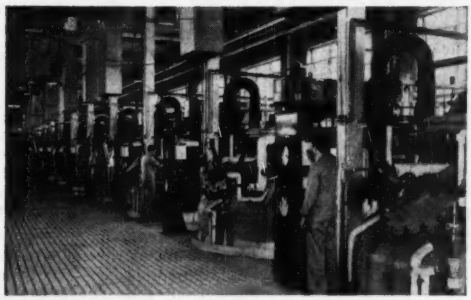
The DuPont cellulose sponge is made by a method which does not fall under any of the three listed classifications. A pulverized salt of controlled crystal size is dispersed in a mixture of viscose and bonding fibers. The resultant mixture is pressed into molds and submerged in an acid coagulating bath. During the coagulation, which is similar to that in the rayon and cellophane processes, the salt crystals dissolve and form the connecting pores in the sponge.

In a variation of this process, scrub mop yarn strands are made by application of the viscose-salt mixture to

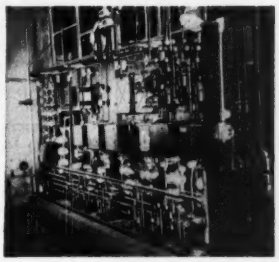
Engineering Achievements Speed Production for the Nation's Health



Solvent distribution system used in the manufacture of CORTONE*



Partial view of fermentors used in production of vitamins and antibiotics



Hookup of control panel for automatic operation in vitamin production

OUTPUT of the new Merck Cherokee Plant, Danville, Pa., will expand significantly the Nation's supply of vitally needed CORTONE, vitamins, and antibiotics.

To meet this important production goal, intricate new processes and equipment had to be developed and installed; known methods had to be improved and modernized. Thus, the construction of the Cherokee Plant represents a signal achievement in chemical engineering.

Merck takes pride in applying chemical engineering skills to increase the availability of disease-fighting agents.

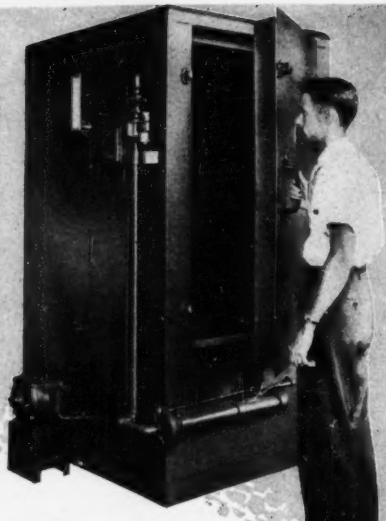
Merck Fine Chemicals

CORTONE *is the registered trade-mark of Merck & Co., Inc. for its brand of cortisone.*

Research and Production for the Nation's Health

MERCK & CO., INC.
Manufacturing Chemists
RAHWAY, NEW JERSEY
In Canada: MERCK & CO. Limited—Montreal

© Merck & Co., Inc.



Lower portion of this gas fired oven completely contains blower and heater . . . in space that might otherwise be wasted. Horizontal recirculation of the heated air insures even heat, efficient operation.

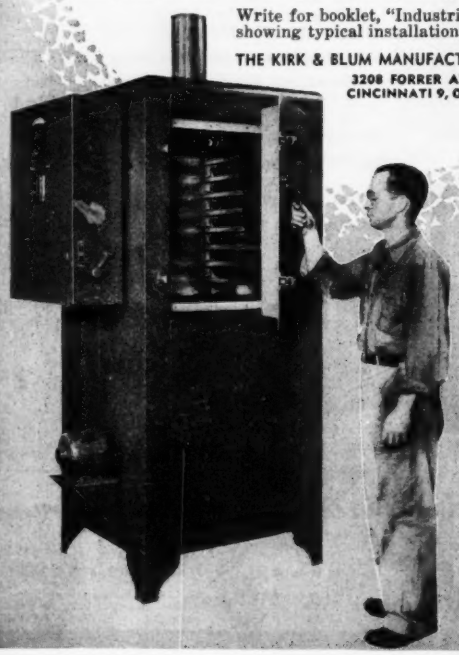
Compact, Efficient···
Automatically Controlled Ovens

Your oven needs . . . large or small, batch or continuous production, for drying, baking or dehydrating . . . can be filled by KIRK & BLUM.

The small ovens illustrated are shipped completely assembled, thoroughly tested and ready to operate. Installation is a one-two process: Spot in place . . . make connections . . . and you're ready for production.

Write for booklet, "Industrial Ovens," showing typical installations.

THE KIRK & BLUM MANUFACTURING CO.
3208 FORRER AVE.,
CINCINNATI 9, OHIO



Electric laboratory type oven used by noted resistor manufacturer in making TV set components. Uniform drying heat is provided by recirculation of air provided by blower and heaters enclosed in base.

cotton yarn prior to submerging the yarn in the coagulating bath.

No other products are known to be made by this method, so it is not listed as a general classification. However, it would seem that other applications for such a process are possible. In this process, the disperse phase is a soluble salt, not a gas. Possibly a sublimable solid such as powdered dry ice could be used as the disperse phase to evaporate after coagulation of the continuous phase; or a powdered fusible solid such as ice might be dispersed, later melted and pressed or dried out.

To summarize, the continuous-flow whipping process gives lowest production costs where it can be used. All liquid materials must be pumpable. If a quick foam stabilization is necessary the gelling agent must give a delayed reaction to avoid coagulation in the mixer. However, if closed cell structure is required, Methods B or C must be used.

Under increasing demand, manufacturing techniques must continue to develop. High-frequency heating shows promise in the quick curing of vinyl sponges and could conceivably permit manufacture of more synthetic resin foams by the whipping technique, by reducing the necessity for a foam stabilizing agent.

New uses for low density solids develop daily. The foamed-in-place resins would seem to have many unexplored uses. Quite possibly the whipping process could be developed to use the foamed-in-place technique, and portable equipment might be used to pump the walls of buildings full of fireproof insulating foam which would fill otherwise inaccessible recesses and set in a few hours to a solid mass.

Generous cooperation of the various manufacturers who supplied information on their products is much appreciated as is that of the Marco Co., of Wilmington, for information on the Marco foam generator. Thanks are due too to the American Foam Rubber Corp., for information and photographs on the AMF Oakes mixer installation, to the writer's company, and particularly to D. B. Crawford, of AMF, for his many helpful suggestions regarding this manuscript.

REFERENCES

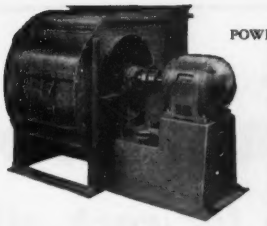
Crocker, E. C., Manufacture of Latex Foam Rubber, *Rubber Age*, **67**, 305-11, June 1950.

Production of Expanded Unicellular Polyvinyl Chloride, *Rubber Age*, **69**, 222, May 1952.

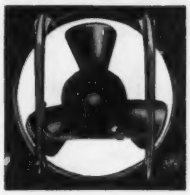
Foam Plastics as Engineering Materials, *Product Engineering*, **23**, 192-8, April 1952.

Oakes, E. T., Continuous Mixing in the Candy Industry, Paper before 4th annual prod. conf. of Manuf. Confectioners Assn., Bethlehem, Pa.

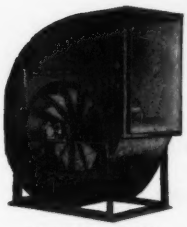
AXIAL FLOW FANS



POWER PLANT FANS



BREEZO FANS

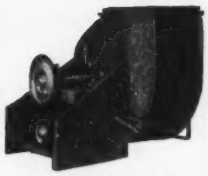


LIMIT-LOAD FANS

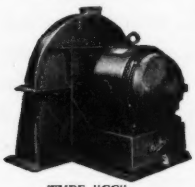
75 years of building dependable air handling equipment

VOLUME FANS

TYPE "CB" PRESSURE BLOWERS



BELTED VENT SETS



TYPE "CC" PRESSURE BLOWER

RE BLOWERS-EXHAUSTERS

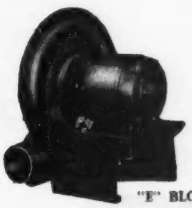
Efficient Air Handling Units
To Satisfied Customers
Since 1877

We welcome the opportunity to solve *your* problem.

BABY CONOIDAL FANS

BELT AIR FANS

INDUSTRIAL EXHAUSTERS



"E" BLOWERS-EXHAUSTERS

SHORTBOY VENTILATING SETS

FIRST FOR FANS

BUFFALO "Buffalo" FORGE COMPANY

BUFFALO, NEW YORK

PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

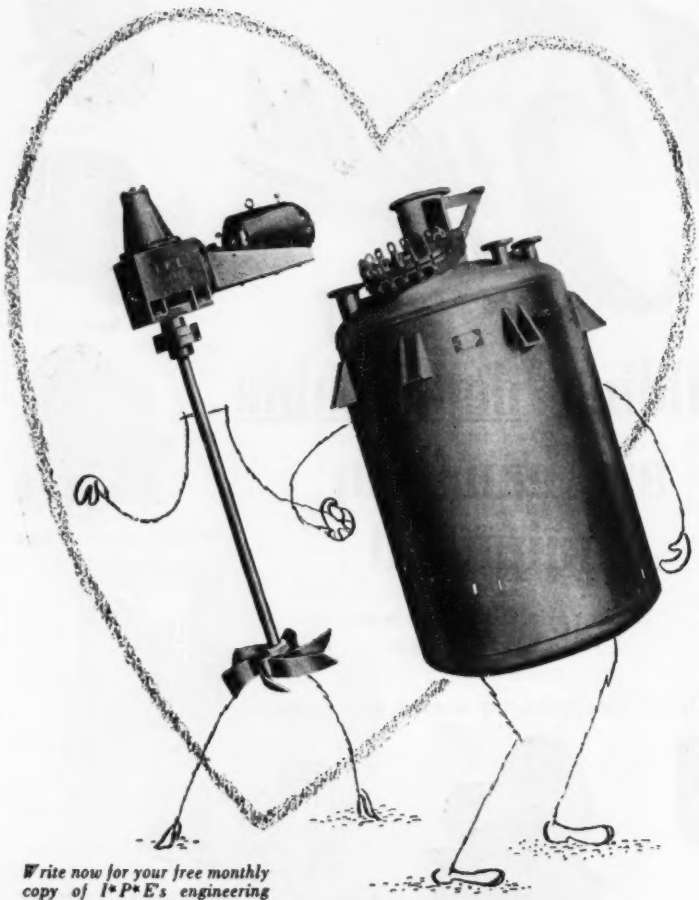
Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

DIAMOND JUBILEE 75TH ANNIVERSARY

VENTILATING | PRESSURE BLOWING | AIR CLEANING | COOLING | AIR TEMPERING | HEATING | INDUCED DRAFT | FORCED DRAFT | EXHAUSTING

A VESSEL and an AGITATOR

that are *"made for each other"* give you...



1. BETTER PROCESS PERFORMANCE
2. MORE EFFICIENT OPERATION
3. LESS MAINTENANCE
4. GREATER OVERALL ECONOMY
5. NO INSTALLATION PROBLEMS

It's just good sense that a process unit that is designed and constructed as an *integral unit* is going to be better in every way. Vessel and agitator complement each other both mechanically and functionally, and each contributes to the particular needs of your process.

That's why it pays to see what I*P*E can do for you. Whether you need help in engineering and designing a process unit, or just need a source of better fabrication in accordance with your specifications, you'll find that I*P*E gives you *more* for your money.

*Write now for your free monthly copy of I*P*E's engineering bulletins on "Practical Equipment Design and Construction."*

INDUSTRIAL PROCESS ENGINEERS

2 Lister Avenue, Newark 5, New Jersey

ENGINEERS, DESIGNERS AND MANUFACTURERS OF PROCESS PLANTS AND EQUIPMENT

ANNOUNCING

Nitrogen Division

ALLIED CHEMICAL & DYE CORPORATION

Nitrogen Division, Allied Chemical & Dye Corporation, was formed June 1, 1952, by combining the Sales Agency Department of The Barrett Division and the Nitrogen and Organic Chemicals Sections of The Solvay Process Division, Allied Chemical & Dye Corporation.

Ammonia Liquors • Anhydrous Ammonia
A-N-L* Nitrogen Fertilizer • A-N-W Solution
ARCADIAN* Nitrate of Soda • Crystal Urea
Formaldehyde • Methanol • Nitrogen Solutions
NYTRON* (Synthetic Organic Detergent)
Solution 32 • Sulphate of Ammonia
URANA† Solution • Urea Feed Compound
Urea Fertilizer Compound • Urea-Spray Fertilizer

The Sales Agency Department of The Barrett Division formerly sold the nitrogen products manufactured by The Solvay Process Division. The formation of the Nitrogen Division consolidates production and sales into one organization, thus streamlining these two operations for greater efficiency.

Nitrogen Division now operates and markets the output of the Nitrogen plants at Hopewell, Virginia, and South Point, Ohio. Some of the products now handled by the Nitrogen Division are listed at left.

Other new plants and new products will be announced at an early date.

Production and sales will be handled by essentially the same personnel that has functioned heretofore . . . your assurance of high standards of product quality and reliable, dependable service, backed by more than 60 years of experience.

Nitrogen Division
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

*Trade-Mark Reg. U. S. Pat. Off. †Reg. Applied For.

PRODUCT CONTROL THROUGH INFRARED ANALYSIS

Number 7 *of a Series of Data Sheets for Better Process Control from The Perkin-Elmer Corporation, Manufacturers of Infrared Spectrometers, Flame Photometers and Electro-optical Instruments.*

PROBLEM:

Determining oil and phenols in effluent water.

DEVELOPED BY:

The Atlantic Refining Company, Philadelphia, Pennsylvania.

SOLUTION:

Infrared analysis. Method is based on bromination of the phenols, extraction of the bromides from water with carbon tetrachloride, and measurement of optical density at 2.84 microns (for phenols) and 3.40 microns (for oils).

INSTRUMENTATION:

Perkin-Elmer Model 12-A Infrared Spectrometer, LiF Prism, 50 mm glass cell with quartz windows.

DISCUSSION:

The petroleum industry has long been concerned with elimination of both hydrocarbon oil and phenols from its effluent waters. A number of analytical methods are now in use but none has both sensitivity and accuracy desired for future pollution abatement programs.

Classical methods for determination of oil in water are limited to concentrations above 1 ppm.

Infrared analysis:

Sensitive to 0.1 ppm of oil and 10 parts, or less, per billion of phenol, (see tables) with an accuracy better than that obtainable by existing methods—not affected by volatility of material being determined.

REFERENCE:

"Infrared Spectrophotometric Determination of Oil and Phenols in Water." R. G. Simard, Ichiro Hasegawa, William Bandaruk and C. E. Headington, Anal. Chem. 23, 10 (1951).

Sensitivity of Phenol Method

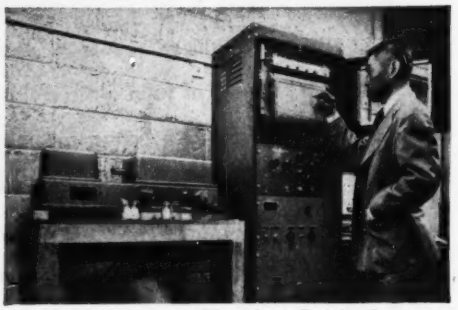
Compound	Phenol Present PPM	Phenol Found PPM	Recovery %
Phenol[a]	0.01	0.008	80
o-Cresol[b]	0.01	0.006	60
	0.012	0.016	133
	0.031	0.034	110
	0.049	0.054	111
	0.061	0.078	128

[a] Phenol calibration used.
[b] o-Cresol calibration used.

Sensitivity of Oil Determination[a]

Waste Oil Added, PPM	Waste Oil Determined, PPM
1.2	1.1
1.2	1.0
0.1	0.1
0.1	0.1
0.0	0.04

[a] Water extracted with 10 ml of CCl_4 per liter.



Model 12 Spectrometer at The Atlantic Refining Company.

Let us discuss your Product Control Problems with you.

THE PERKIN-ELMER CORPORATION
NORWALK, CONNECTICUT

ARE YOU RECEIVING INSTRUMENT NEWS?

This 8-page quarterly brings you the latest developments in electro-optical instrumentation as well as their application to research and process control.

Chemical Engineer's Bookshelf

Edited by Lester B. Pope

Soothing

PRINCIPLES OF GEOCHEMISTRY. By Brian Mason. John Wiley & Sons, Inc., New York. 276 pages. $5.

There're three reasons why you might want to read or buy this book on the physico-chemical laws governing the earth and its evolution:

- You're one of those rare persons working directly in the field of geochemistry. Then you'll certainly want to own your own reference copy of this first concise, up-to-date textbook to place alongside that older classic, Clarke's "Data of Geochemistry." Mason summarizes the significant facts and ideas on the chemistry of the earth, synthesizes them into a coherent account of the earth's physical and chemical evolution. He stresses interpretation.
- You're one of those not-so-rare persons working in a closely related field — nuclear research, mining, geology, soil research, crystallography, geophysics and the like. Then you'll want to read "Principles of Geochemistry," perhaps buy a copy for yourself.
- You're just one of those inquisitive persons who likes to learn about all sort of things—preferably those that don't have anything to do with your job or everyday life. Then you might enjoy Mason's book; that is, if you can manage to find the time these days to do any idle, inquisitive reading at all. But a warning: Mason isn't easy reading, so take a look at it in a library before you rush off and buy a copy. You'll find geochemistry particularly soothing in an election year.—*JRC*

European

COOLING TOWERS. By J. Jackson. Butterworths Scientific Publications, London. 104 pages. $3.50.

Reviewed by H. E. Degler

Containing 72 pages of text material on cooling towers, this handbook's emphasis is on mechanical-draught models. There are also 29 pages (six appendixes) of correlated information on theory, temperature and psychrometric data, costs and economic factors, plus a list of symbols, bibliographical references, and glossary.

The book reflects British concepts and practice, and not too recent American designs. Because of lower design air temperatures, large capacity European cooling towers are generally of the chimney-type natural draft design as described by the author. The preface implies that the text material reflects limited experience and research on mechanical draught towers. Today's American engineering emphasis is almost exclusively on the induced draft design.

Because of the many variables in water-cooling tower calculations and performance, it is difficult to provide simple handbook equations, tables and graphs whereby a non-specialist could readily select the type, size and details of a tower unit for any one of the many possible combinations of fluid quantities, temperatures and applications.

The book implies that the non-specialist can follow the procedure outlined and determine the required details of a tower for a specified set of performance conditions. This can be done only if experimental data are available for the particular design involved. Each American manufacturer has a semi-confidential method of sizing a tower, based upon research and actual performance correlated with definite requirements.

Mr. Jackson's book presents the basic theory of the counterflow induced draft tower, derives some theoretical equations, makes numerous assumptions, and by examples, tables, and graphs outlines his design procedure. However, the non-specialist reader (mentioned in preface) would probably soon become hopelessly lost if he attempted a design when conditions varied very much from those used by the author. All in all, the book does present "food for thought" for the engineer who has a fundamental knowledge of the heat transfer process in a cooling tower.

American terminology differs from English practice for cooling towers, such as "pond" for cold water basin, "precipitation" for drift, "purge" for blow down, "total heat" for enthalpy, zero enthalpy of air at 32 deg. F. instead of 0 deg. F., and others. But it is a refreshing experience to explore these new words and their correlated usage.

Also included is a short chapter on "Gas-Cooling Towers," wherein the process of cooling hot gases by direct contact with cold water in packed towers is the reverse of that of water cooling. This may be of academic interest to American readers; we generally use closed heat exchangers (either air of water-cooled) for this application.

Autobiography

THE MEMOIRS OF HERBERT HOOVER — 1920-1933 — THE CABINET AND THE PRESIDENCY. The Macmillan Co., New York. 405 pages. $5.

Reviewed by H. C. Parmelee

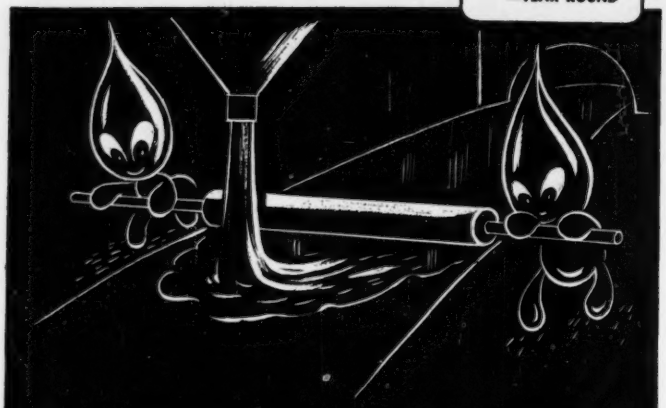
The second volume of Mr. Hoover's memoirs deals with his years of public service. In reading this portion of his biography one early gets the impression that in both private and public life Mr. Hoover knew what he wanted to do and did it as far as he was able. The book reveals a man of purpose, of intellectual honesty, of high moral standards, with an exceptional grasp of economic, social, and political problems, unusual administrative ability, and a sincere desire to serve his fellow men. The contrast with his successors in public office is strikingly in his favor.

When he returned to the United States after World War I he was "steeped with two ideas." First, that the American way of life transcended all others of history; second, that it was in danger of infection from the "boiling social and economic caldron of Europe" unless measures were taken to prevent it. This experience led him to believe that through public service he might do something to avert disaster and make a constructive contribution to the preservation of the principles and ideals that had made the United States a favored nation. Consequently he abandoned his engineering career and devoted himself to the welfare of his country and its citizens. The painstaking preparation of his memoirs is further evidence of his spirit of service, because they preserve for historians a true record of his effort to support the American philosophy of life and condemn the fallacious systems advocated by "a sprinkling of intellectuals . . . stimulated by the fumes from the caldrons of Europe."

Mr. Hoover's training and experience as an engineer was turned to the nation's advantage during his public life. Throughout the book one notes the engineering, rather than the political, approach to social, economic, and political problems. His formula might be condensed into some such

Kathabar

MAINTAINS IDEAL PRODUCTION WEATHER IN YOUR PLANT—EVERY DAY —YEAR ROUND



Humidity Conditioning saves Photo Paper Manufacturer $40,000.00 yearly

The Haloid Company, prominent Rochester, N. Y. photographic paper manufacturer, installed Kathabar humidity conditioning equipment to supply dry air for *continuous* tunnel drying of emulsion-coated photographic paper. Kathabar replaced conventional air conditioning equipment and *saves Haloid $40,000 annually.* In addition to improving Haloid's product quality, the Kathabar equipment paid for itself in the first year. Kathabar is providing substantial savings for other chemical manufacturers, too, and daily is preventing costly caking and accumulation of explosive fumes and dusts.

LET US SEND YOU informative case histories as well as "The Humidity Engineer." These studies will tell you what Kathabar has accomplished for others. They may give *you* an idea how to profit from Kathabar's use.

SURFACE COMBUSTION Corporation

TOLEDO 1, OHIO

Kathabar — HUMIDITY CONDITIONING SYSTEMS

'Surface' — INDUSTRIAL FURNACES AND BURNERS

Janitrol — AUTOMATIC HEATING EQUIPMENT

CE-7

☐ Send me case histories and complete information on Kathabar humidity conditioning equipment.

☐ Send me information on .....
(Write here any special humidity problem you may have)

NAME.....

COMPANY.....

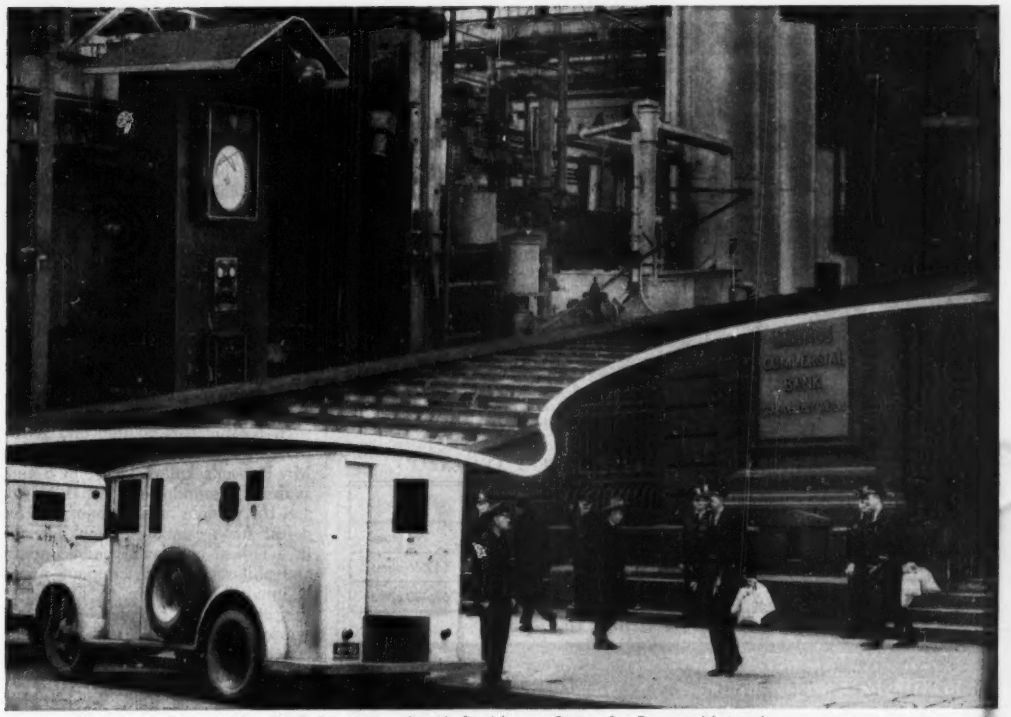
ADDRESS.....

CITY.....ZONE.....STATE.....

phrase as "summon the experts, hold hearings, assemble the facts, and prepare recommendations." A good example is his campaign for the elimination of waste in industry. This was begun before he held public office and continued through his years as Secretary of Commerce. The technique was to investigate the technology of an industry, convene a meeting of its representatives, business and labor, develop a program and cooperate in its advancement. In this there was no dictation or force of law; but during his eight years as Secretary of Commerce more than 3000 such meetings or committees were activated to the great benefit of industry. And much of his work was marked by another technique, now thoroughly unorthodox and abandoned. Money was raised privately for many of his projects, instead of running to Uncle Sam for handouts. We had the wholesome and salutary spectacle of people helping themselves, with the wholehearted cooperation of their Government.

It was as Secretary of Commerce that Mr. Hoover had a great opportunity to display his talent for constructive activity. Prior to his secretaryship the department amounted to little. "Putting the fish to bed and turning on the lights around the coast were possibly the major concepts of the office." But under his direction the department was reorganized and vitalized. Typically, just after taking office, he sought the cooperation of twenty-five leaders in business, labor, and agriculture to serve as an advisory committee on policies and undertakings of the department. Anyone who had close contact with the department in those days will recall some of its projects—elimination of waste in industry, expansion in electric power, simplification and standardization of industrial products, advancement of uniform specifications, research in pure and applied science, development of foreign trade, battling foreign monopolies, better homes for the people, and numerous other projects. The department was living up to the terms of its Enabling Act. In addition to these things Mr. Hoover had influence in the matter of foreign loans, labor relations, aid to agriculture, development of water power, commercial aviation, radio broadcasting, and commercial fisheries. Supplementing all these activities was the publication of *The Survey of Current Business*, which gave statistics on business trends and conditions.

During his presidency Mr. Hoover pursued many of the projects he initiated as Secretary of Commerce. Much of his attention was directed



Modern Safeguards—Brink's for Money, Bailey for Process Materials

Are Your Process Materials Guarded As Well?

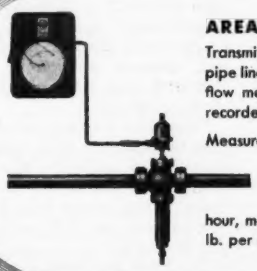
HERE'S HOW TO PREVENT SPOILAGE AND WASTE . . .

TO avoid waste of valuable process materials and finished products, process rates and conditions must be accurately measured and controlled. That's where Bailey Meters, Analyzers and Controllers can help you to improve the efficiency of your plant.

Take flow for instance. Bailey Meter Company offers a complete line of flow measuring and controlling equipment for applications ranging all the way from high pressure steam to low pressure gas. We measure flow in pipes, open channels, ducts, furnaces, smelters, kilns, ovens, dryers.

When you call Bailey Meter Company, you get the help of years of experience as well as recommendations from a wide selection of measuring and controlling devices.

Your local Bailey Engineer is as near as your telephone. He has the experience and the equipment necessary to set up an effective guard for your process materials. P-26



AREA TYPE FLOW METER

Transmitter goes into 1, 2 or 4 inch pipe line like a valve and transmits flow measurements electrically to recorder in remote location.

Measures oil and other clear liquids under static pressures up to 600 psi. Minimum range 0 to 1200 lb. per hour, maximum range 0 to 9600 lb. per hour.

BAILEY METER COMPANY

1054 IVANHOE ROAD
CLEVELAND 10, OHIO

Process Controls
TEMPERATURE · FLOW
PRESSURE · LEVEL
GAS ANALYSIS · RATIO

HIGH PRECISION
Thermistors
from a high precision source

made to your order for
resistance values • size
temperature coefficient • mountings • quality

Widely useful as temperature measuring elements and as liquid level sensors, these temperature responsive resistors are built by Bendix-Friez under a system of quality controls set up to meet exacting military standards of accuracy. You can count on them as the very best obtainable, whether purchased from stock or made to your own specification. Ask for a list of applications.

STANDARD TYPES IMMEDIATELY AVAILABLE

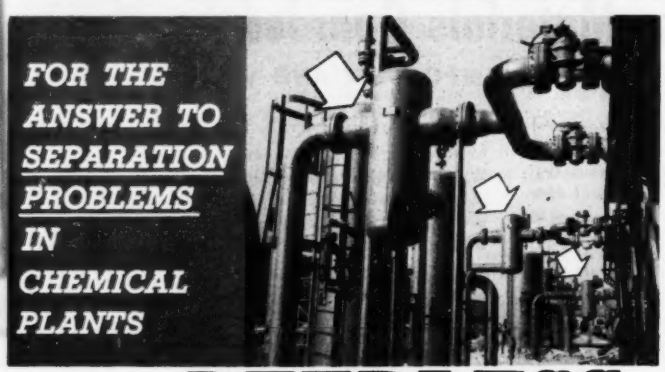
Typical application in capsule form for temperature sensing of hydraulic oil.

Size (inches)	@ +30°C.	@0°C.	@ −30°C.
.140 x ¾	45 ohms	88 ohms	193 ohms
.040 x 1.5	14,000 ohms	29,946 ohms	74,676 ohms
.018 x 1.5	40,000 ohms	94,040 ohms	262,400 ohms

Write for details to Dept. G

FRIEZ INSTRUMENT DIVISION of
1324 Taylor Avenue • Baltimore 4, Maryland
Export Sales: Bendix International Division, 72 Fifth Ave., N. Y. 11, N. Y.

Bendix AVIATION CORPORATION



SEE **PEERLESS**

Shown above are five Peerless line separators on outlet lines from cooling tower efficiently extracting entrained liquid. Performance Guaranteed. Call Peerless to solve your entrainment problem.

PEERLESS MFG. CO.

PEERLESS MANUFACTURING CO.
P. O. BOX 7193 ★ DALLAS, TEXAS ★ Dixon-8431
REPRESENTATIVES IN ALL PRINCIPAL CITIES

toward reforms—reforms in law enforcement, in the Executive branch of the Government, in veterans' affairs, the tariff, and the regulation of business. In connection with the latter he expressed his firm opposition to the Government being in business in competition with its citizens. Among social reforms he favored old-age pensions, unemployment insurance, better housing, and care of children. It was typical of his philosophy that he interested the leading mutual insurance companies in devising an old-age insurance policy, instead of running to the Government to foot the bill. Unfortunately the depression made it impossible to launch the project.

In reading this volume one is repeatedly struck with the breadth of Mr. Hoover's knowledge of men and affairs, the soundness of his thinking, and the wisdom of his proposals. His defeat for reelection, which ushered in a radical change in our economy and philosophy of government, made it impossible for him to finish the projects he had initiated. One can sympathize, however, with his own conclusion: "I am so immodest as to believe that had we been continued in office we would have quickly overcome the depression and approached economic and social problems from the point of view of correcting marginal abuse and not of inflicting a collectivist economy on the country. We would have better preserved the personal liberty to which the nation was dedicated." Considering the record of the preceding twelve years, he would have had better than a fifty-fifty chance to make good.

Herculean

STRUCTURAL CHEMISTRY OF INORGANIC COMPOUNDS. Vol. II. By W. Huckel. Elsevier Press, Houston. Pages 440-1094. $13.50

Reviewed by F. C. Nachod

Second volume of Dr. Huckel's herculean effort to systematize inorganic chemistry is called Book III. It comprises such topics as volatility, crystal chemistry, silicates, metals and alloys, chemical reaction in inorganic chemistry, and lines of research in chemical science.

What your reviewer said about Vol. I in the October 1951 issue of this journal, also applies to this Vol. II. There is a wealth of information contained in the present book but it will take patience and skill on the reader's part to find it.

Dr. Long has done a nice job in translating the German manuscript.

Yet there are some minor shortcomings that could have been eradicated. For example, ions are shown with + and — notation in one portion of the book, and with the European . and , style in another. This can hardly be considered "systematic."

Again, reservations must be made in recommending this potentially very useful text.

Metals

MECHANICAL PROPERTIES OF METALS AT LOW TEMPERATURES. National Bureau of Standards Circular 520. 206 pages. Superintendent of Documents, Washington 25, D. C. $1.25

The National Bureau of Standards Semicentennial Symposium on Mechanical Properties of Metals at Low Temperature was held at the bureau on May 14 and 15, 1951. This cloth-bound proceedings affords the maker and user of special metals for equipment construction a splendid reference book from which he may draw on the experience of specialists who took part in the symposium.

Chemical engineers interested in the life and behavior of such metals at very low temperatures will find in this book a unique composite of knowledge based on real experience.

Element No. 25

ELECTROLYTIC MANGANESE AND ITS ALLOYS. By Reginald S. Dean. The Ronald Press., New York. 257 pages. $12.

Reviewed by Ernest S. Nossen

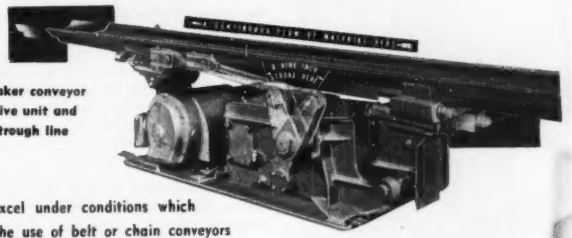
7,500,000 lb. of electrolytic manganese metal are produced annually. This production will be doubled in 1953. How it is produced, the problems and their solutions in this young industry started in 1939, are dealt with in Dean's book. Dr. Dean initiated the pilot plant work of the Bureau of Mines and was from then on connected with this work and with the metallurgical investigation of alloys of other metals with electrolytic manganese.

The chemical engineer and the electrochemist will be especially interested in Chapter I, dealing with the production of electrolytic manganese. Flowsheets of the first installations open the way to the process. Figures regarding the quantities of materials to be handled are contained in part in the discussion of the individual steps of the process: Roasting of the ore, leaching, the critical step of purification of the leach solution, the electro-

NEW! GOODMAN SHAKER CONVEYORS

offer a practical and economical method of moving hot and abrasive materials.

Whatever you want to move—coke, sinter, steel scrap, castings, silicon carbide, mill scale, dolomite, bauxite, or other hot, abrasive material—it will pay you to investigate Goodman's specially designed shaker conveyors.

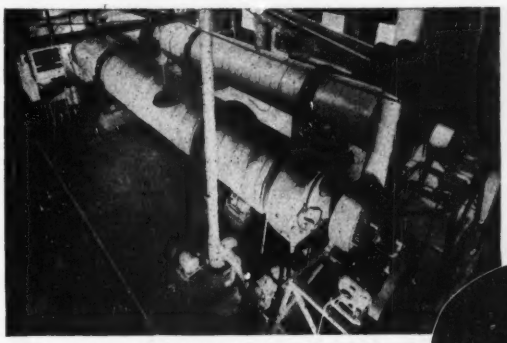


Shaker conveyor drive unit and trough line

They excel under conditions which make the use of belt or chain conveyors impractical. Small tonnages or large tonnages are moved with ease, for short or long distances—upgrade, downgrade, or on the level.

Every Goodman Shaker Conveyor installation is engineered to suit its specific application.

GOODMAN MANUFACTURING COMPANY
Industrial Manufacturing Division
Halsted Street at 48th — Chicago 9, Illinois



TWO DIRECT FIRED DRYERS

DIRECT FIRED DRYER

If your product is not critical to high temperatures, you can dry it more economically in a Davenport Rotary flash or direct fired dryer. Let Davenport engineers assist you. Write for our complete catalog. For quick reference see "Sweet's 1952 Processing Industries" or "Chemical Engineering Catalog, 1953".

DAVENPORT MACHINE and FOUNDRY COMPANY
DAVENPORT 7 — IOWA, U. S. A.

DAVENPORT
De-watering Presses and Screens.

ROTARY
Steam Tube, Hot Air and Direct Fire Dryers.
Water Tube and Air Coolers.

CASE HISTORY SERIES

FEED PREPARATION AHEAD OF PELLET MILLS

For coarse grinding of dried Sugar Beet Pulp ahead of pelleting machines a 75 H.P. Rietz RDH-18 Disintegrator operates at a capacity of 10,000 pounds per hour. The uniformity of grind produced by the Disintegrator makes possible a greatly increased capacity output from the pellet mills resulting in reduced capital investment requirements per ton of material produced.

Rietz Disintegrators are also used in preparing many other feed materials ahead of pelleting machines with similar savings or the production of a better product.

Write for free technical bulletin covering the above installation

Equipment for the food and chemical process industries

Rietz MANUFACTURING CO.
Santa Rosa, California

An EASIER WAY To Remove Packings

Use DURA HOOKS

Rugged, flexible, hand-tools that "work around corners" for removing old packing from stuffing boxes. They SAVE TIME . . . put an end to fussing and cussing . . . improves your manpower efficiency. WRITE FOR DURA HOOK Bulletin DHCE covering SIZES and PRICES.

★ All Steel Flexible shaft

Tempered tool steel corkscrew bit

The PERFECT SEAL

DURAMETALLIC CORPORATION
KALAMAZOO MICHIGAN

lysis of the solution with the effects of concentration, current density and cell temperature. This discussion is illustrated by tables and curves. The results obtained with different materials for the electrodes particulary for the anode are analyzed.

The engineer working in electrowinning of other metals will find a lot of information about the new metal in this book, the one working in this special field might consult the original papers and patents extensively cited at the end of the section.

The reviewer shares the opinion of the author that "electrolytic manganese might become one of the least costly nonferrous metals," even if the chapter dealing with the economic aspects is not very clear and the estimate of the author certainly too optimistic. This chapter also contains a paragraph about electroplating with manganese.

In Chapter II the author shows the metallurgical properties of alloys with electrolytic manganese: Alloys of copper, of nickel, of copper and nickel, of copper and zinc, alloys with light metals and alloys with silver, titanium and other metals.

In Chapter III the author gives data on mechanical properties of alloys made with iron and electrolytic manganese. Iron-chromium-manganese alloys have an enormous tensile strength and may replace stainless steel for several uses. However they are not so acid resistant and can not be recommended above 1,500 deg. F., a disappointing feature for the chemical engineer interested in an equivalent but less expensive and scarce construction material than stainless steel.

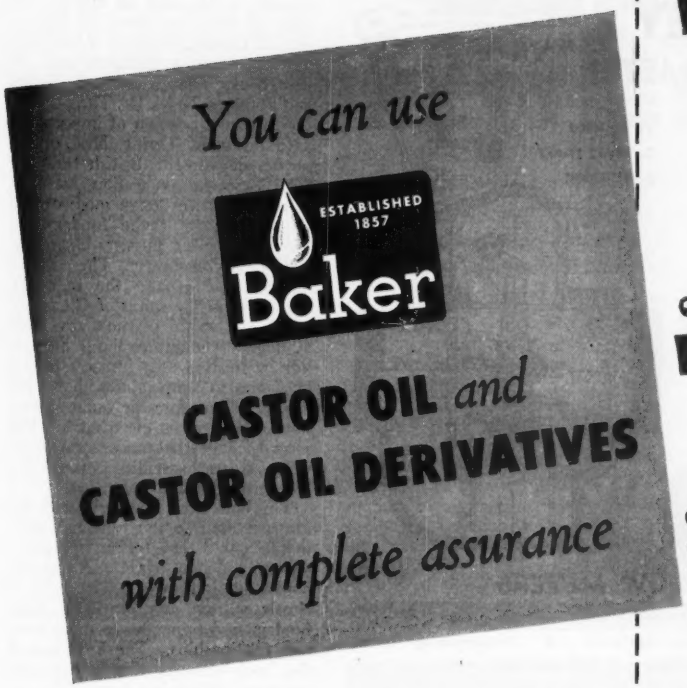
Dr. Dean's presentation of the great variety of alloys with manganese and their sometimes surprisingly favorable physical properties will contribute to widen their application in the metallurgical field. The editor should have the credit for giving this book the form and appearance it deserves.

Above 400 Deg. C.

THE SCIENCES OF FLAMES AND FURNACES. By M. W. Thring. John Wiley & Sons, New York. 416 pages. $6.50.

Reviewed by B. K. McKee

The Promethean theft of fire made civilization possible. From earliest times man has used fire to cook his food and heat his dwelling; in modern times fire has a third vital use, to heat industry's furnaces. In these glowing furnaces are made many of the basic materials of modern life: glass,



When you specify Baker Castor Oils and Castor Oil Derivatives you are sure of two things:

1. That each Baker product is the finest commercially available.
2. That the technical men who stand behind the product are top men in the field.

Our Technical Service Department is always available for consultation.

OILS

Refined Castor Oils
Processed (Blown) Castor Oils
Polymerized Castor Oils
Mineral Oil Soluble Castor Oils
Hydrogenated Castor Oil
Acetylated Castor Oils
Dehydrated Castor Oils
Emulsifiable Castor Oils
Castor Oil Dispersions

ESTERS

Ricinoleate Esters
Acetyl Ricinoleate Esters
Octadecadienoate Esters

ACIDS

Castor Oil Acids
Dehydrated Castor Oil Acids
Undecylenic Acid

ALDEHYDES

Heptaldehyde

SOAPS

Potassium Ricinoleate
Ammonium Ricinoleate
Barium Ricinoleate
Calcium Ricinoleate
Cadmium Ricinoleate
Zinc Ricinoleate
Zinc Undecylenate

ESTABLISHED 1857

THE Baker CASTOR OIL COMPANY

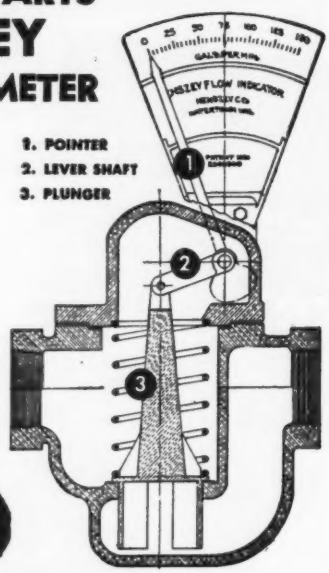
Largest Producers in the United States of Castor Oil and Castor Oil Derivatives
120 BROADWAY, NEW YORK 5, N. Y.
Plants: Jersey City, Bayonne, N. J. and Los Angeles, Cal.

Only 3 MOVING PARTS *in the* HENSZEY *Indicating* FLOW METER

Only three moving parts—the Pointer, the Lever Shaft and the Plunger. That means continued service and CONSTANT ACCURACY.

The liquid enters below the plunger, forcing it upward and exposing more area of the metering slots so that the motion is in direct proportion to the flow.

The graduations on the dial are uniformly spaced from one end to another and read direct—without constants. The meter is installed right in the pipe line.



For Details Consult Sweet's Catalog or Write

HENSZEY COMPANY
Dept. E-7, WATERTOWN, WISCONSIN

HENSZEY

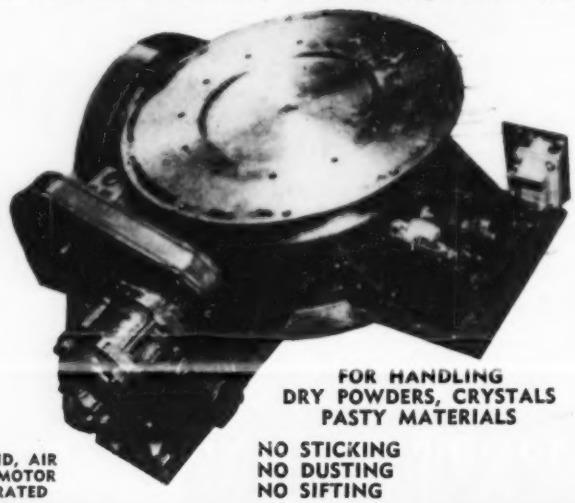
***Indicating* FLOW METERS**

Continuous Blowdown • Distillation System • Heat Exchangers
Feed Water Meters • Boiler Feed Regulators • Proportioning Valves
also MILK EVAPORATORS and PRE-HEATERS

FOR MORE SATISFACTORY CONTROL

GEMCO SPHERICAL DUST-TITE VALVES

FOR BINS, HOPPERS, BLENDERS, PIPE LINES



FOR HANDLING
DRY POWDERS, CRYSTALS
PASTY MATERIALS

HAND, AIR OR MOTOR OPERATED

NO STICKING
NO DUSTING
NO SIFTING

GENERAL MACHINE COMPANY OF NEW JERSEY
400 MARKET STREET NEWARK 5, NEW JERSEY

cement, bricks, and all metals. In spite of the importance of the industrial furnace, however, it has never developed into a precision tool. A new book, The Science of Flames and Furnaces, by M. W. Thring, gives the furnace a position of importance.

In his book, Thring, head of the physics department, British Iron and Steel Research Association, attempts to make furnace design more certain by applying to it the fundamental sciences such as physics, chemistry, and physical chemistry. The author's purpose is "to raise the industrial furnace from the status of Cinderella before the arrival of the Fairy Godmother." The author limits his subject by treating only furnaces heated by flames to temperatures above 400 deg. C. Therefore, he omits discussion of all types of electrical furnaces as well as industrial processes in which steam is used as the medium for transferring heat.

This book deals principally with the furnaces used in the iron and steel, non-ferrous, refractories, ceramics, cement and lime, glass, and coal carbonization industries. The book is clearly written and progresses from fundamental principles to more complex relationships. The first page of the book answers the fundamental question, "What is a furnace?"

In his first chapter the author describes the type of furnaces in use in many industries and points out their virtues and shortcomings. He then discusses the laws of thermodynamics and applies these laws to such problems as those of preheat, use of waste heat, recirculation of flue gases, and the use of oxygen with furnace fuel. Keeping the principle of thermodynamics before the reader, the author outlines the ideal furnace from a thermodynamic standpoint.

The book next deals with the liberation of heat by combustion, discussing speeds of reaction of gaseous, liquid, and solid fuels and ways of controlling the quantity, quality, and course of combustion. After having treated the first of the energy conversion processes, the author next considers the second conversion process, heat transfer, or the transfer of flame thermal energy to thermal energy of the material being heated. He deals with heat transfer in traditional manner, breaking it down into conduction, convection, and radiation. As both combustion and heat transfer are strongly affected by the flow of the gases in the furnaces, the next section of the book discusses the aerodynamics of hot systems. To properly design a furnace, it is necessary to know the total quantity of gas

FEED PREPARATION AHEAD OF PELLET MILLS

For coarse grinding of dried Sugar Beet Pulp ahead of pelleting machines a 75 H.P. Raymond

results obtained with different materials for the electrodes particulary for the anode are analyzed.

The engineer working in electrowinning of other metals will find a lot of information about the new metal in this book, the one working

400 MARKET STREET NEWARK 5, NEW JERSEY

416

FEED PREPARATION AHEAD OF PELLET MILLS

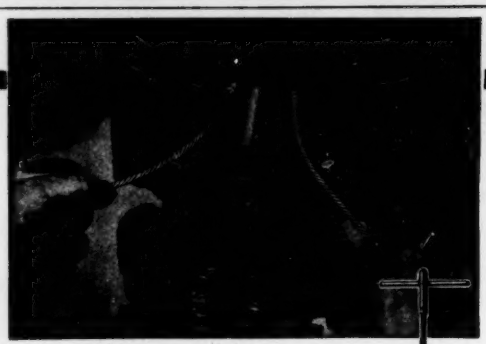
For coarse grinding of dried Sugar Beet Pulp ahead of pelleting machines a 75 H.P. Rietz RDH-18 Disintegrator operates at a capacity of 10,000 pounds per hour. The uniformity of grind produced by the Disintegrator makes possible a greatly increased capacity output from the pellet mills resulting in reduced capital investment requirements per ton of material produced.

Rietz Disintegrators are also used in preparing many other feed materials ahead of pelleting machines with similar savings or the production of a better product.

Write for free technical bulletin covering the above installation

Equipment for the food and chemical process industries

Rietz MANUFACTURING CO.
Santa Rosa, California



An EASIER WAY To Remove Packings

Use DURA HOOKS

Rugged, flexible, hand-tools that "work around corners" for removing old packing from stuffing boxes. They SAVE TIME . . . put an end to fussing and cussing . . . improves your manpower efficiency. WRITE FOR DURA HOOK Bulletin DHCE covering SIZES and PRICES.

★ All Steel Flexible shaft

Tempered tool steel corkscrew bit

The PERFECT SEAL

DURAMETALLIC CORPORATION
KALAMAZOO MICHIGAN

results obtained with different materials for the electrodes particulary for the anode are analyzed.

The engineer working in electrowinning of other metals will find a lot of information about the new metal in this book, the one working in this special field might consult the original papers and patents extensively cited at the end of the section.

The reviewer shares the opinion of the author that "electrolytic manganese might become one of the least costly nonferrous metals," even if the chapter dealing with the economic aspects is not very clear and the estimate of the author certainly too optimistic. This chapter also contains a paragraph about electroplating with manganese.

In Chapter II the author shows the metallurgical properties of alloys with electrolytic manganese: Alloys of copper, of nickel, of copper and nickel, of copper and zinc, alloys with light metals and alloys with silver, titanium and other metals.

In Chapter III the author gives data on mechanical properties of alloys made with iron and electrolytic manganese. Iron-chromium-manganese alloys have an enormous tensile strength and may replace stainless steel for several uses. However they are not so acid resistant and can not be recommended above 1,500 deg. F., a disappointing feature for the chemical engineer interested in an equivalent but less expensive and scarce construction material than stainless steel.

Dr. Dean's presentation of the great variety of alloys with manganese and their sometimes surprisingly favorable physical properties will contribute to widen their application in the metallurgical field. The editor should have the credit for giving this book the form and appearance it deserves.

Above 400 Deg. C.

THE SCIENCES OF FLAMES AND FURNACES. By M. W. Thring. John Wiley & Sons, New York. 416 pages. $6.50.

Reviewed by B. K. McKee

The Promethean theft of fire made civilization possible. From earliest times man has used fire to cook his food and heat his dwelling; in modern times fire has a third vital use, to heat industry's furnaces. In these glowing furnaces are made many of the basic materials of modern life: glass,

Only 3 MOVING PARTS in the HENSZEY

cement, bricks, and all metals. In spite of the importance of the industrial furnace, however, it has never developed into a precision tool. A

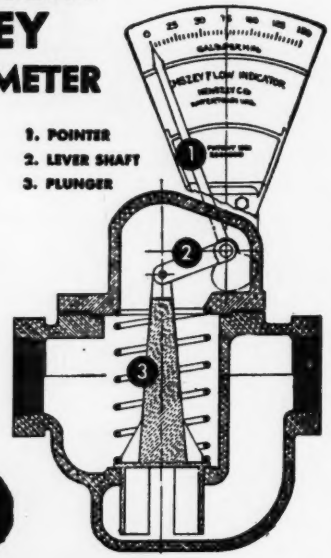
Only 3 MOVING PARTS *in the* HENSZEY *Indicating* FLOW METER

Only three moving parts—the Pointer, the Lever Shaft and the Plunger. That means continued service and CONSTANT ACCURACY.

The liquid enters below the plunger, forcing it upward and exposing more area of the metering slots so that the motion is in direct proportion to the flow.

The graductions on the dial are uniformly spaced from one end to another and read direct—without constants. The meter is installed right in the pipe line.

1. POINTER
2. LEVER SHAFT
3. PLUNGER



For Details Consult Sweet's Catalog or Write

HENSZEY COMPANY
Dept. E-7, WATERTOWN, WISCONSIN

HENSZEY

Indicating FLOW METERS

Continuous Blowdown • Distillation System • Heat Exchangers
Feed Water Meters • Boiler Feed Regulators • Proportioning Valves
also MILK EVAPORATORS and PRE-HEATERS

FOR MORE SATISFACTORY CONTROL

GEMCO SPHERICAL DUST-TITE VALVES

FOR BINS, HOPPERS, BLENDERS, PIPE LINES

FOR HANDLING
DRY POWDERS, CRYSTALS
PASTY MATERIALS

HAND, AIR OR MOTOR OPERATED

NO STICKING
NO DUSTING
NO SIFTING

GENERAL MACHINE COMPANY OF NEW JERSEY
400 MARKET STREET NEWARK 5, NEW JERSEY

cement, bricks, and all metals. In spite of the importance of the industrial furnace, however, it has never developed into a precision tool. A new book, The Science of Flames and Furnaces, by M. W. Thring, gives the furnace a position of importance.

In his book, Thring, head of the physics department, British Iron and Steel Research Association, attempts to make furnace design more certain by applying to it the fundamental sciences such as physics, chemistry, and physical chemistry. The author's purpose is "to raise the industrial furnace from the status of Cinderella before the arrival of the Fairy Godmother." The author limits his subject by treating only furnaces heated by flames to temperatures above 400 deg. C. Therefore, he omits discussion of all types of electrical furnaces as well as industrial processes in which steam is used as the medium for transferring heat.

This book deals principally with the furnaces used in the iron and steel, non-ferrous, refractories, ceramics, cement and lime, glass, and coal carbonization industries. The book is clearly written and progresses from fundamental principles to more complex relationships. The first page of the book answers the fundamental question, "What is a furnace?"

In his first chapter the author describes the type of furnaces in use in many industries and points out their virtues and shortcomings. He then discusses the laws of thermodynamics and applies these laws to such problems as those of preheat, use of waste heat, recirculation of flue gases, and the use of oxygen with furnace fuel. Keeping the principle of thermodynamics before the reader, the author outlines the ideal furnace from a thermodynamic standpoint.

The book next deals with the liberation of heat by combustion, discussing speeds of reaction of gaseous, liquid, and solid fuels and ways of controlling the quantity, quality, and course of combustion. After having treated the first of the energy conversion processes, the author next considers the second conversion process, heat transfer, or the transfer of flame thermal energy to thermal energy of the material being heated. He deals with heat transfer in traditional manner, breaking it down into conduction, convection, and radiation. As both combustion and heat transfer are strongly affected by the flow of the gases in the furnaces, the next section of the book discusses the aerodynamics of hot systems. To properly design a furnace, it is necessary to know the total quantity of gas

that will flow through the system and to be able to predict the velocity distribution inside specific parts of the system.

After the sections dealing with the scientific principles which fix the design of the furnace, the author goes into detail on the science of furnace construction and discusses available refractories and their properties and the principles of wall and crown construction.

After having discussed the application of the scientific method to industrial furnace design, the author admits that in industrial practice, the deviations from theory are large. For this reason, much of furnace design must still remain an art. The last chapter of the book deals with means of diagnosing and correcting faults in furnaces that do not function completely satisfactorily.

Narrow

INDUSTRIAL HEAT TRANSFER. By F. W. Hutchinson. Industrial Press, New York. 326 pages. $6.

Reviewed by D. F. Othmer

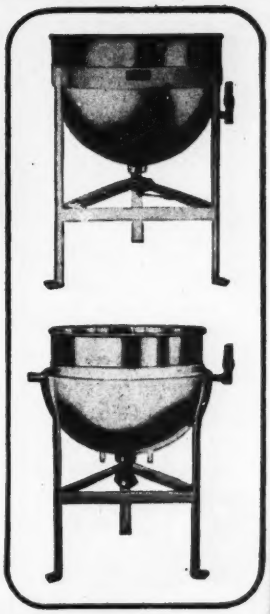
Following a pattern initiated ten years ago by Stoever in his elementary book on heat transfer, this book holds as its primary distinction the presentation of several simple algebraic equations in graphical form. In fact, it is stated in the preface that one of the objectives is to eliminate the need for computation in heat transfer work. In this reviewer's experience this is hardly an attitude to be commended since it overemphasizes the attainment of a numerical answer without due concentration on its merits.

A second objection stems from the information and equations which form the bases for the plots. Instead of referring to original references and establishing his deviations directly from the experimental data, the author requotes other authors who themselves have modified the data to suit their own limited purposes.

As an example, in his treatment of heat transfer coefficients outside commercial exchanger bundles, the author presents without qualification the obsolete equation for flow outside and normal to a single tube. All other variations in the design of the baffled exchanger are covered by percentages of the value so obtained. All exchangers with triangular pitch are deemed to have coefficients 30 percent greater than the base. For square pitch the reader has his choice of reducing the completely spurious 30 percent coefficient by 7½ or 20 percent—take your pick.

This practice is then formalized

LEE
CORROSION-RESISTANT
KETTLES



Lee Kettles meet every processing need. They are practical, easy to clean and keep clean, meet all sanitary regulations and are available in sizes up to 500 gallon capacity.

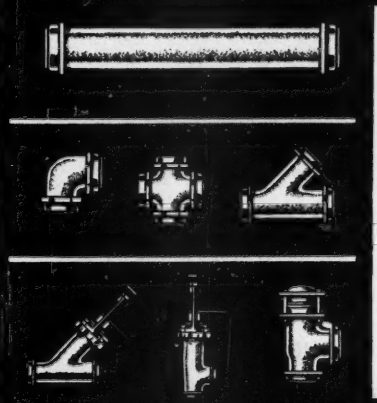
For longer service and greater all-around dependability, specify LEE *Corrosion-Resistant Kettles.*

Our descriptive technical bulletins sent on request.

LEE METAL PRODUCTS CO., INC.
417 PINE STREET, PHILIPSBURG, PA.

ALL LEE KETTLES ARE MADE TO A.S.M.E. CODE

for the BEST in corrosion resistant
FLUIDS HANDLING SYSTEMS
Specify ILLINOIS
PORCELAIN



PIPE
VALVES
FITTINGS
JOINTS
EJECTORS
RASCHIG RINGS
SPECIAL SHAPES

Write for FREE Copy of Chemical Porcelain Catalog No. C-4

ILLINOIS ELECTRIC PORCELAIN CO.
MACOMB ILLINOIS

If your plans call for piping that must withstand the most difficult pressure, temperature, or corrosion conditions, you can rely on our experienced specialists to save you time and money. For more than fifty years we have been prefabricating and installing piping for the nation's leading utilities and process plants, and we pioneered in methods for welding stainless. Regardless of the size of your next project, send us your drawings for an estimate—you'll be glad you did.

INDEPENDENT FABRICATORS AND ERECTORS

WESTPORT JOINT
W. K. MITCHELL & CO., INC.
2948 ELLSWORTH STREET
PHILADELPHIA 46, PA.
REPRESENTATIVES IN BOSTON, NEW YORK, CLEVELAND, MOBILE AND HAVANA
MITCHELL

Here's A Real Contribution To Progress In

CORROSION CONTROL

Acid-Proof Duct and Pipe Sections

SOLID PLASTIC AND LINED PIPE AND DUCTS REDUCE MAINTENANCE COSTS AND HELP ELIMINATE COSTLY DOWNTIME—

Yes—a great deal of progress has been made by the Heil corrosion engineers in developing materials and application techniques toward better corrosion resistance.

Practically all corrosion conditions can now be easily handled with a wide choice of available materials.

PLASTIC • RUBBER • LEAD

Sales Representatives in all Principal Cities

Write for illustrated literature today

HEIL PROCESS EQUIPMENT CORP. 12901 Elmwood Ave. Cleveland 11, Ohio

Other Heil Products Include: Impervious Graphite Heating and Cooling Units • Lined Storage and Process Tanks • Acid-Proof Maintenance Materials • Structural Plastics • Steam Jet Agitators

by ascribing to it the dignity of a "recommendation." Furthermore, the author's two main sources of information are each ten or more years old and have been superseded in the literature time and time again. The whole concept of isothermal representation of heating and cooling has been neglected.

Of the 326 pages in the book, 145 pages are given over to the plot of the basic Nusselt equation 70 times for selected individual compounds. It is difficult in our minds to justify separate plots for carbon tetrachloride, chlorobenzene, chloroform and innumerable other organic compounds when the same could have been accomplished with a single nomograph. Or better still the equations can be solved in two to three minutes from a single table of properties of the chemical compounds.

It is misleading to represent the book as a text when it reduces the informative material on the whole field of heat transfer to some 50 or 60 pages without the benefit of a single illustration or derivation to abet the pedagogy. It is also unfortunate that a title has been chosen which has been identified with Dr. Schack's pioneer book, or that the biblography which has only eight entries neglects to mention Schack.

The book does not depict any broad range of industrial practice but instead refers to isolated instances. The book will have little appeal to men of collegiate rank but may conceivably prove useful to operating personnel who would prefer a simple, if not accurate answer.

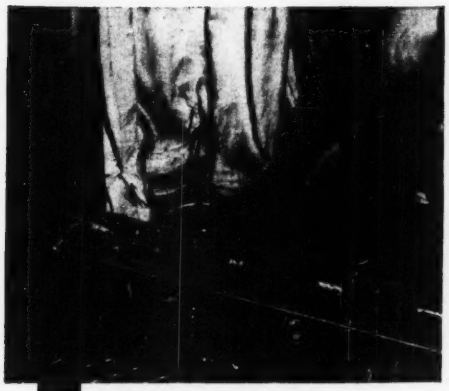
No More Entropy

THERMODYNAMICS OF THE STEADY STATE. By K. G. Denbigh. John Wiley & Sons, New York. 104 pages. $1.75.

Reviewed by F. C. Nachod

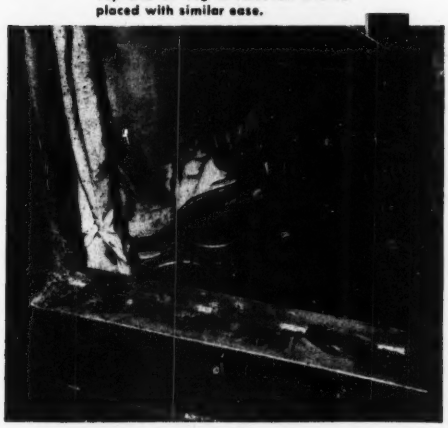
We generally do not make a distinction between equilibrium and the steady state both being time invariant conditions but only the latter referring to a system which is open to its environment. Dr. Denbigh carefully leads the reader into the subject of steady state relationships. The little booklet is a masterful collection of essay type lectures based on Thomson's hypothesis and Onsager's theory of microscopic reversibility. It would seem to this reviewer that particularly those of our colleagues who would gladly part with such time-honored concepts as entropy would greatly benefit by reading this scholarly piece of work.

WHY DO THINGS *The Hard Way...*



Unretouched photos show ease and speed of changing bags: quick-release clamp is removed in seconds—

—filter bag then slips off lower collar. Top end of bag is removed and replaced with similar ease.



...WHEN DRACCO FILTER MAINTENANCE IS SO EASY?

The special mechanical design of Dracco Dust Control Equipment reduces filter maintenance in two important ways:

1. **Dracco Filters last longer**

   —skilled engineering and accurate manufacturing prolong the life of filter bags and moving parts.

2. **Replacing Dracco Filter bags is simpler**

   it's *easy*—no awkward, unwieldy frames or screens to move in and out of filter housing.

   it's *clean*—all work is done on clean air side.

   it's *fast*—quick-release clamping devices save valuable time.

Dracco Dust Control Equipment has many other superior features which will provide an economical solution for your dust problem. Why not call in Dracco today?

DRACCO CORPORATION

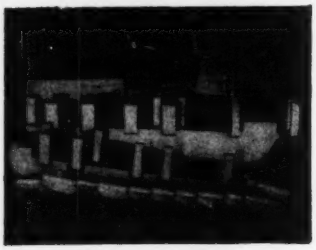
Harvard Avenue and East 116th St. • Cleveland 5, Ohio

Write today for the Dracco Engineering Data Sheet which will facilitate an analysis of your dust problem. Address Dept. C-7, Cleveland 5, O.

DRACCO *Performance Proved*

DUST CONTROL EQUIPMENT · PNEUMATIC CONVEYORS

FAMOUS AVIATION COMPANY EQUIPS NEW PLANT WITH COMPLETE EXHAUST SYSTEM RESISTANT TO CORROSIVE FUMES



PLA-TANK®

RESIN-BONDED FIBERGLAS®

Pictured above is but a portion of an order for PLA-TANK parts placed by a well-known aviation company for installation in their new plant. This picture shows the Exhaust Hoods complete with Ducts for a down draft exhaust system.

All of these parts, as well as many others not shown (including tanks for dips and plating solutions) were fabricated of PLA-TANK. PLA-TANK is a corrosion-resistant material, made of Fiberglas, impregnated and bonded with polyester resins. It is molded into strong, rigid units, light in weight but extremely durable. These units are resistant at temperatures from −60°F. to +280°F. PLA-TANK is not just a lining but equally resistant inside and out.

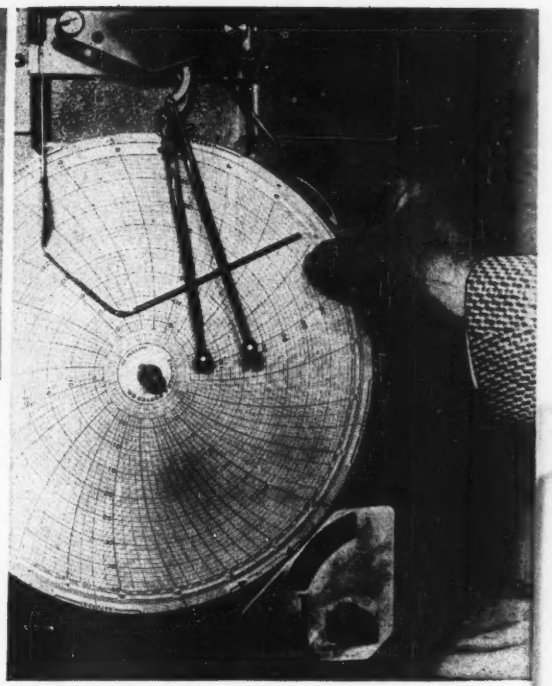
By combining standard stock units with custom fabricated parts a complete system may be developed for the transfer of your corrosive exhausts and fumes. And it may be used with corrosive liquids, too, as it is also fabricated in the form of tanks, tank linings, pipe and pipe fittings.

Data Sheets Sent on Request

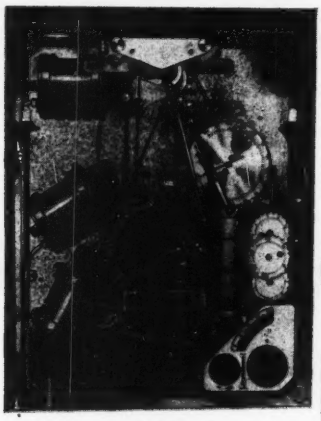
Recent Books & Pamphlets

Subject	Summary	How to Order
Chemicals	Properties and essential information for safe handling and use of sodium and potassium dichromates and chromates. 12 pages.	Chemical Safety Data Sheet SD-46. Manufacturing Chemists Assn., 15th and H Sts., Washington 5, D. C. 25 cents.
Radioactivity	Five chapters cover nuclear transformations; uranium, fission, and transuranium elements; isotopic tracers and electron transfer reactions; quantitative kinetic studies with tracers; self-diffusion of aqueous ions. 89 pages.	"Radioactive Atoms and Isotopic Tracers." By Joseph W. Kennedy. 26th Annual Priestley Lectures. Phi Lambda Upsilon, Dept. of Chemistry, Pennsylvania State College, State College, Pa. $2.
Fuels	Tabulated statistics on consumption of fuels by manufacturing groups, fuels and the production worker, fuel costs. Also covers electric power in manufacturing, fuels and power in the iron and steel industries. 28 pages.	"An Economic Study of Fuels in Manufacturing." By W. H. Voskuil. Engineering Experiment Station, University of Illinois, Urbana, Ill. 40 cents.
Consultants	A blueprint of the essential requirements for compatible and constructive relations between client and consultant chemist and chemical engineer. The consultant's services—why, when and where. 29 pages.	"The Consulting Chemist and Chemical Engineer in a World Economy." Assn. of Consulting Chemists and Chemical Engineers, 50 East 41st St., New York 17, N. Y. $1.
Natural Gas	Vapor-liquid phase data on the methane-nitrogen system necessary for engineering design of equipment for removing nitrogen from natural gas. 36 pages.	"Physical-Chemical Properties of Methane-Nitrogen Mixtures." By O. T. Bloomer and J. D. Parent. Bulletin 17. Institute of Gas Technology, 17 West 34th St., Chicago 16, Ill. $3.50.
Instruments	Comparative study of the Bean and Burnett apparatus as to accuracy and reproducibility in determination of deviations from the ideal gas law and ease of operation in obtaining this data and in calculation of the results. 12 pages.	"Measurement of Gas Law Deviations with Bean and Burnett Apparatus." By O. T. Bloomer. Bulletin 13. Institute of Gas Technology, 17 West 34th St., Chicago 16, Ill. $2.
Gaskets and Grooves	Authoritative source of information for the size designation of rings. Tables, dimensional drawings. 12 pages.	"Ring-Joint Gaskets and Grooves For Steel Pipe Flanges." ASA B16.20-1952. American Society of Mechanical Engineers, 29 West 39th St., New York 18, N. Y. $1.
Nonmetallic Gaskets	Types and sizes, material, dimensions and tolerances, formulas for determining diameters. 8 pages.	"Nonmetallic Gaskets for Pipe Flanges." ASA B16.21-1951. American Society of Mechanical Engineers, 29 West 39th St., New York 18, N. Y. $1.
Synthetic Rubber	Listing of available translations of recent German patent applications and German and Russian research reports on plastics and synthetic rubbers. 12 pages.	Research Information Service, 53 Nassau St., New York 38, N. Y. Gratis.
Air Pollution	Sets forth the principles and methods to be followed in the collection of samples used for the study of air pollution problems, and describes various types of sampling equipment. Illustrations and diagrams of equipment. 40 pages.	"Air Pollution Abatement Manual, Chapter 6." Manufacturing Chemists' Assn., 15th and H Sts., Washington 5, D. C. 75 cents.

NEW
FISCHER & PORTER
automatic
FLOW RATIO CONTROLLER



Compact size with extreme precision of ratio control are important advances in this *new* Fischer & Porter Ratio Controller. Designed specifically for flow ratio control, it makes a perfect combination teamed with the new P-4 Pneumatrol and highly accurate Flowrator meters or variable area cell kinetic manometers, to assure accurate and dependable ratio control of fluids, gases or slurries. Receives pneumatic, electrical, or electronic primary signals. Review the features below, then mail the handy coupon for complete engineering and application data.



Interior view of standard Ratio Controller with pneumatic set ratio adjustment.

The compact stack mounting of the new Ratio Controller atop the P-4 Pneumatrol provides the simplest possible unit. The large (10½" scale) ratio setting dial permits precise ratio settings which are visible through the door. F&P wide range, linear scale primaries give extreme range of ratio (6:1 to 1:1 to 1:6; a total of 36:1).

CHECK THESE FEATURES:

- Extreme flexibility
- Wide range of ratio
- Based on linear scale primaries
- Control deviation indicator
- Primary element fully corrosion resistant
- Highly visible ratio setting dial
- Extremely compact stack mounting

© 1717

FLOWRATOR

FISCHER & PORTER COMPANY

570 COUNTY LINE ROAD, HATBORO, PENNA.

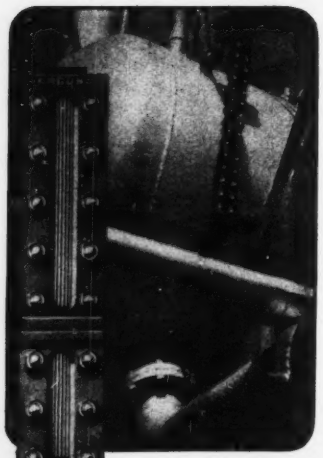
Please send me by return mail complete information on your new Ratio Controller.

NAME_____ POSITION_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____



You're Better Off Using JERGUSON Flat Glass GAGES

They keep you out of trouble . . . and Save You Money

You get a lot of plus values . . . and avoid a lot of failure headaches and possible accidents . . . by using Jerguson Flat Glass Gages for every liquid level indicating use.

Jerguson Reflex Gage

You get the kind of gages and valves you want to do YOUR JOB. Jerguson offers you the most complete line available. Jerguson offers you an engineering organization specializing in building special gages to meet problems.

Jerguson Flat Glass Gages save money and labor. They are easy to install. They stand up . . . you don't have to keep servicing them or replacing the glass. They are available in a wide range of sizes, pressures, designs and materials; also with polished end stems to replace present tubular gages.

Write us about your problems or requirements.

JERGUSON

Gages and Valves for the Observation of Liquids and Levels

JERGUSON GAGE & VALVE COMPANY

100 Foliaway, Somerville 45, Mass.

Representatives in Major Cities

Phone Listed Under **JERGUSON**

Jerguson Tress Gage & Valve Co. Ltd., London, Eng.

RECENT BOOKS & PAMPHLETS, cont. . .

Subject	Summary	How to Order
Packaging	For steel shipping containers, plant locations and types of containers manufactured, annual production of the various types, utilization by industries. 36 pages.	Steel Shipping Container Institute, 600 Fifth Ave., New York 20, N. Y.
Russian Chemistry	Cross index to the English translation of the *Journal of General Chemistry of the USSR*. Titles of papers, author index, subject index, index to organic compounds.	Consultants Bureau, 152 West 42nd St., New York 18, N. Y. $5.
Copper	Compilation of all the ASTM standards pertaining to copper and copper-base alloy products. The 114 specifications and test methods cover plate, sheet, rolled bar and strip; rod, bar and shapes; pipe and tubes; wire; sand and die castings; arc-welding electrodes and brazing solder. 504 pages.	American Society for Testing Material, 1916 Race St., Philadelphia 3, Pa. $4.75.
Bolts and Nuts	Complete dimensional specifications and recommendations on standard materials. This standard, in combination with recent unification of screw threads, brings to a successful conclusion efforts of Britain, Canada and America to unify their practices. 36 pages.	"Square and Hexagon Bolts and Nuts." Standard B18.2-1952. American Society of Mechanical Engineers, 29 West 39th St., New York 18, N. Y. $2.
Safety	Advance planning management must do to control plant disasters. Organization chart, steps to be taken in preparing plant and personnel. 20 pages.	"Before Disaster Strikes." Association of Casualty and Surety Cos., 60 John St., New York 38, N. Y.
Isotopes	Table listing AEC isotope allocations made between August 1946 and June 1951. The table tells the location of each project, a brief description of it, its status or reference. 89 pages.	"Radioisotope Applications of Industrial Significance." TID-5078. Office of Technical Services, Dept. of Commerce, Washington 25, D. C. 30 cents.
Thermodynamics	For all inorganic compounds and organic compounds containing not more than two carbon atoms: values for the heat and free energy of formation, entropy, heat capacity, and heats and temperatures of transition, fusion and vaporization. 1268 pages.	"Selected Values of Chemical Thermodynamic Properties." Circular 500, National Bureau of Standards. Supt. of Documents, Washington 25, D. C. $7.25.
Security	Latest manual (Dec. 13, 1951) for the purpose of establishing uniform security practices within industrial plants. 17 pages.	"Industrial Security Manual For Safeguarding Classified Security Information." Supt. of Documents, Washington 25, D. C. 15 cents.
Materials Handling	Safety precautions which should be observed by personnel preparing various types of tank cars for unloading. Pertinent regulations of the ICC and references to various state and local requirements. 12 pages.	"Unloading Flammable Liquids From Tank Cars." Manual Sheet TC-4. Manufacturing Chemists' Assn., Woodward Bldg., 15th and H. Sts. N.W., Washington 5, D. C. 20 cents.
Isotopes	A detailed account of isotope utilization during the first five years of the AEC's distribution program. Prepared as a reference for investigators using or contemplating the use of isotopes and as documentary evidence of the value of radioactive and concentrated stable isotopes to modern research and technology in science, medicine, agriculture and industry. 451 pages.	"Isotopes—A Five-Year Summary of United States Distribution". Supt. of Documents, Washington 25, D. C. $1.

5'0" dia. x 17' long Stainless Steel Vacuum Tank, ¼" thick. 28" x 8' Fixed Tube Steel Shell, Stainless Steel Heads—Vacuum—380 PSI Design—Code Stamped (this Fixed Tube unit bolts on bottom of above tank).

Your needs- OUR SPECIALTY

CORRECT DESIGN, RIGHT MATERIALS...

. . . yes, DOWNINGTOWN's experience and research in the fabrication of various grades of Carbon Steel, Stainless Steels, Nickel-Clad, Stainless-Clad, Monel-Clad, Cupro-Nickel, Aluminum, etc., may be of help to you. We are equipped with the most modern facilities to handle complete jobs, within our limitations, in the correct alloys and methods of fabrication required to assure maximum operating efficiency.

DOWNINGTOWN also maintains a Heat Transfer Division under the direction and supervision of men thoroughly trained and experienced in this field. Our Engineering Consultation is at your service to aid you in preparation of plans and specifications for definite jobs.

DOWNINGTOWN IRON WORKS INC.

NEW YORK OFFICE, 30 CHURCH STREET

DOWNINGTOWN IRON WORKS, INC.
DOWNINGTOWN, PA.
STEEL & ALLOY PLATE FABRICATION
HEAT EXCHANGERS

Put In Less...Take Out More—

SEQUESTER IRON with

Pfizer Sodium Gluconate

● Here's the proof that you put in less...take out more when you sequester iron with Pfizer Sodium Gluconate, Technical. On this chart are the results of a recent study in our laboratories on the iron sequestering power of various sequestering agents. Of the four chemicals on the chart, you will note that Sodium Gluconate exhibited by far the best results in sequestering the ferric ion over a wide range of pH. Pfizer Sodium Gluconate, Technical, is a stable, free-flowing, tan-colored, crystalline powder. It is available in 100-lb. multi-wall paper bags. Try the sequestering agent with proved results. "Put in *less sequestering agent*...take out *more iron*"...with Pfizer Sodium Gluconate, Technical. Contact Pfizer today for more detailed information about this study. Call or write:

CHAS. PFIZER & CO., INC.
630 Flushing Ave., Brooklyn 6, N. Y.
Branch Offices: Chicago, Ill.; San Francisco, Calif.; Vernon, Calif.

Manufacturing Chemists for Over 100 Years

PFIZER QUALITY ® PFIZER

How the Investor Looks at Us

Never before has the general investor shown such keen interest in the chemical process industries. Why is he so fascinated—but so often confused and snared?

The Chinese combine the words "opportunity" and "danger" to form their word for "crisis."

And this provocative blend of meanings may well describe the situation facing the non-technical investor when he decides to put his money into some new venture in the chemical or chemical process industries. For these industries offer unparalleled opportunity—and considerable danger.

He sees only too well how many chemical concerns have been extremely successful in their own fields. He studies their stocks, their sales, their earnings. He reads popular accounts of their short but dramatic history, their daring diversity into new fields. He is impressed by newspaper accounts of the "miracle" products that they make or see in the making.

But too often he doesn't realize that it takes a lot more than capital and the willingness to invest to make a go of a new venture into the chemical processing field.

It takes knowledge of the field—an intimate knowledge of the industry's peculiar (and often treacherous) technology, its markets, the pace of its inter-product and inter-process competition. This pace is likely to be both swift and merciless.

The investor who doesn't have this knowledge would be wise to investigate first—then invest. He can hire competent technical and professional advice. Or he can get assurance that the management of the venture is well-informed and responsible. Or he can play safe and invest his money in those firms with known and reputable records. Or play safer still and stay out altogether.

▶ **Reasons for Risks**—Why do so many businessmen find the process industries such a delicate area to break into? What are the special problems which so confound potential investors?

R. S. Aries and Rudolf M. Cziner of the firm of R. S. Aries & Associates, consulting engineers and economists, have made an analysis of the problems involved in investing in the process industries.

They feel that the basic difficulty refers back to the mysteries of chemistry. Most non-technical businessmen don't understand this science. Their past experience in the mechanical industries and in finance isn't enough preparation for a field where the special effects of chemical changes must be faced in addition to all the usual business hazards.

It's not surprising, therefore, that more chemical engineers are being sought for executive positions in process companies.

And in recent months, investment banks and other financial institutions have begun to rely on technically trained specialists to aid them in formulating policy about investment decisions in the process industries.

One of the first obstacles the non-technical investor runs into is this: Just what is meant by the chemical industry and the chemical process industries (CPI)? What's the relationship between them?

Until fairly recently the investor looked upon the production of chemicals as the sole function of the chemical industry. He considered drugs, fertilizers, food processing, paints and pigments as separate industries.

But the onrush of chemical technology destroyed these neat distinctions. When the chemical engineer took petroleum gases and turned out such chemicals as ethylene oxide, isopropyl alcohol and acetylene—was this manufacture part of the petroleum or chemical industries? When ethylene gas was transformed into a liquid, vinyl chloride monomer, which was then polymerized into a powder—was the resulting industry plastics or chemicals?

Obviously, the term "chemical industry" had become too narrow. The twilight zone between chemicals and other industrial groupings had become too wide.

So the term "chemical process industries" has been adopted to end the confusion. This term refers to any industry which uses chemical materials, chemical engineering techniques and chemical processing equipment in all or a vital part of its manufacturing operations. It means that the molecular structure of the starting materials is altered as well as their shape and appearance.

This enables the investor to distinguish the CPI from those purely mechanical industries that take a raw material, reshape it, add to it, paint it, etc. He could always look at an automobile body and see that it is a steel product. But now he can look through a glass window and understand why it doesn't resemble sand. Or why a Dacron suit has no resemblance to its chemical raw materials.

▶ **The Danger**—One of the perplexing problems confronting the potential investor lies in deciding what raw materials to choose. For once the product has been agreed upon, he or his investing enterprise must determine the best method of production. He sometimes finds it difficult to understand, for example, how alcohol can be made from corn and other grains, potatoes, molasses, natural gas or petroleum.

He learns that this problem of choosing between different raw or starting materials is the general not the special case. For the process industries use just about everything under the sun—and even the sun, as in the solar evaporation of brine to make salt.

Given the raw material, the investor must then often choose between a number of different processes. If the question is one involving the manufacture of say, acetylene from natural gas, he must decide between several manufacturing processes. These processes differ considerably—yet he must put up several million dollars to implement his final decision. And he's out of luck if his decision isn't both technically and economically sound.

What must the investor look for in a process? It's too simple to say that he must select the process best suited (most profitable) to his particular needs. In many cases—acetylene, for example—the different processes are still relatively untested. Even after they're worked out in the laboratory and in pilot plant there is still no sure-fire assurance that full-scale commercial operation is feasible.

Some investors don't realize that many new processes that look attractive on paper turn out to be costly

Hole Accuracy to .0005"
H & K
PERFORATED SCREENS
Screens used in grain testing require an extreme accuracy of diameter for round holes and for dimensions of slotted perforations. Here H & K. screens test only ± .0005 variation in diameter of all the holes per screen. Such accuracy is a part of everyday H & K production.
H & K Screens may also be had to specifications as to kind and temper of metal —or in plastics, rubber, fabrikoids, etc., practically any sheet, coil or plate material. Your inquiry, regardless of specifications, is invited for recommendation and prices.
Remember—H & K Grilles of Beauty for your ornamental applications.
The Harrington & King Perforating Co
5677 Fillmore Street Chicago 44, Ill.
114 Liberty St. New York 6, N. Y.

or worthless. Unless he relies on the judgment of a competent chemical engineer he is apt to be misled by a method that appears deceptively simple. Extracting chlorophyll from alfalfa is no trick. The tough part is in knowing how to use the minimum amount of proper solvents in order to keep costs as low as possible and yet to get the maximum yield.

Many investors have been misled into adopting foreign processes without first reevaluating them in terms of conditions in this country. Labor abroad is cheaper. So European process often requires more manpower than can economically be used in an American operation. And of course, just the opposite problems may arise when a businessman tries to introduce American techniques and processes outside this nation.

▶**The Time Factor**—Impatient investors seldom realize that it may take several years—and many millions of dollars—just to build a major chemical plant. If the process is still in the laboratory stage, it will take a longer time before the plant can commence full-scale operations. More dangerous is the possibility that continuous research may render the plant less economical or even obsolete.

One pharmaceutical house had practically completed a plant for the production of penicillin. At the last minute its own research staff came up with a completely new process. The company decided to go ahead with the new method and hardly used the original plant for penicillin production.

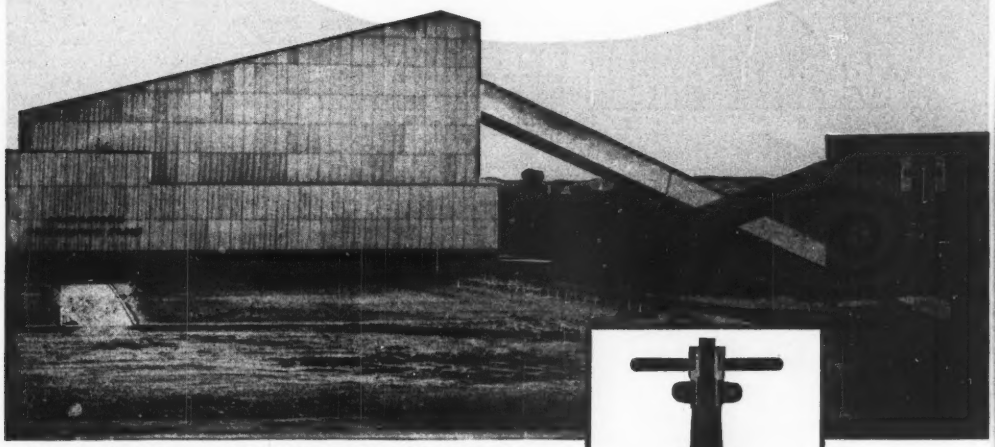
Chemical investment is not only a lengthy process; it is also an expensive one. This serves to compound the already acute risks confronting the potential investor.

▶**The Opportunity**—Yet the CPI are still the pacemakers in American industrial expansion—and the investor now knows this. He knows that expenditures for new plants and equipment have more than doubled the value of fixed assets since 1945. He realizes that chemical research solves supply shortages and provides new products for better living.

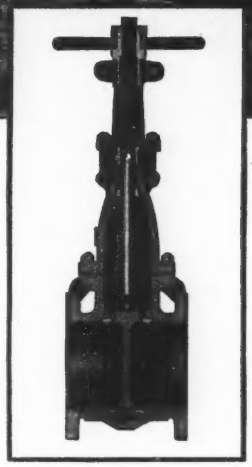
He knows that economists are in fairly general agreement that the growth prospects for chemicals and the process industries are greater than those for any other large industry. Assuming a reasonably satisfactory level of business operations, he has faith—investing faith—that chemical and CPI firms have much growth in store.

Most investors now realize more than ever before that investment in the chemical field is a critical matter —with more than the usual run of risks.

Hanna Coal Company Preparation Plant ... served by the OIC LONG LINE of valves



Hanna Coal Company's mammoth new coal preparation plant in service now at Georgetown, Ohio.



"We've standardized on OIC Valves; all kinds for all kinds of service. They're the best!"

Hundreds of OIC Valves—iron, bronze and steel—were used in this coal preparation plant, completed just a year ago. OIC Valves were selected by Hanna Coal Company after many years' experience with these valves at their other properties—evidence of the fine performance they provide.

Simplify your procurement problems by calling the nearby OIC distributor. The OIC Long Line offers the right valve for every job.

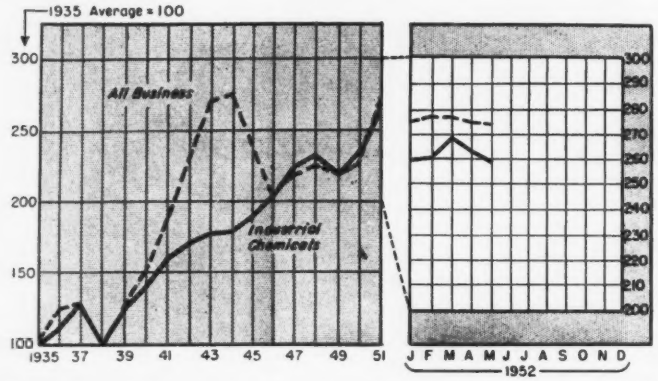
THE OHIO INJECTOR COMPANY
WADSWORTH, OHIO

OIC FOUNDED 1881

VALVES
FORGED AND CAST STEEL • IRON • BRONZE

Process Industry Trends

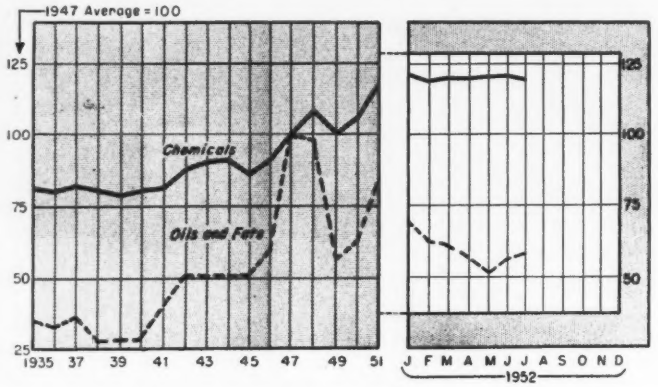
CONSUMPTION



Industrial Chemicals Index

	May (Est.)	April (Prelim.)	March (Revised)
INDEX	259.00	263.30	268.65
Fertilizer		68.66	66.20
Pulp and paper	29.06	28.90	30.49
Petroleum refining	16.58	22.11	26.73
Iron and Steel	15.16	14.64	17.25
Rayon	23.59	22.64	23.53
Glass		21.90	21.78
Paint and varnish		30.09	26.68
Textiles		9.40	9.83
Coal products		10.13	12.03
Leather		4.29	4.29
Explosives		8.92	8.33
Rubber	5.94	6.05	6.11
Plastics		15.57	15.40

PRICES

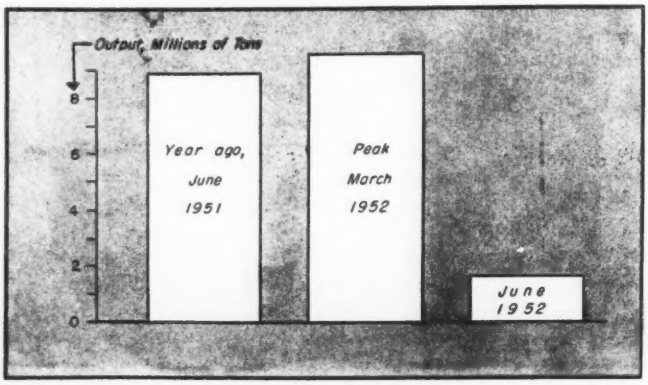


Chemical Engineering's Price Indexes

Chemicals	DOWN	− 0.6%
Oils and Fats:	UP	+ 2.5%

	Chemicals	Oils & Fats
As of July 1, 1952	119.62	57.85
Last month	120.33	56.44
July, 1951	118.98	80.95
July, 1950	102.31	54.45

HIGHLIGHT OF THE MONTH



Steel Strike Hurts

Steel output dropped off in June to slightly more than 1.5 million tons. Peak production month was March when 9.4 million tons was produced. Nearly 10 million tons of steel have been lost because of the steel strikes in April, May and June.

This means less consumption of chemicals by the iron and steel industry this year.

It also means that some of the expansion plans of the chemicals industry will be either deferred until later or put off entirely.

Test Pilot

"Just try those springs," the salesman says and his customer, canny as well as pretty, takes him at his word. She wants to be sure what she's getting.

Testing is a good way to double-check Multiwall bags too. Subject them to the toughest going you can. Make sure your manufacturer checks them also—continuously and against rigid performance standards.

In Union's testing laboratories, Multiwalls have to prove themselves constantly—for strength, durability, moisture resistance, sift-proofness, every characteristic you expect of a good package.

Union Multiwalls are *uniformly* high standard. They are manufactured in the world's largest integrated pulp-to-container plant. Only in an integrated plant can first-hand control be maintained over *every step* of the process by which your package is made.

Best proof of the value of this extra protection is in the buying habits of America's largest Multiwall users. Men who purchase more than 85 per cent of the total production of Multiwalls list* dependable quality as one of their most important considerations in choosing a Multiwall supplier.

Insistence on uniformly high manufacturing standards is one of the many good reasons why, to a greater extent each year, these major buyers turn to Union for a substantial share of their increased Multiwall requirements.

More so every day . . .

IT'S UNION FOR MULTIWALLS

*August, 1951 research study.

UNION BAG & PAPER CORPORATION • NEW YORK: WOOLWORTH BUILDING • CHICAGO: DAILY NEWS BUILDING

New Construction

Proposed Work

Ind., Covington—Olin Industries, Alton, Ill., has purchased a 6665 acre site here and plans to construct cellophane plant. Estimated cost $20,000,000.

Ind., Fort Wayne—Cities Service Oil Co., Bartlesville, Okla., plans to construct plant for bottling and storing propane gas, gasoline storage plant, warehouse and offices on California Rd. near Fort Wayne Speedway. Estimated cost $3,000,000.

Mass., Dighton—Arnold Hoffman & Co., Inc., 55 Canal St., Providence, R. I., manufacturer of chemicals, dyes, etc., plans to construct 3 story, 60x120 ft. plant addition. Jenks & Ballou, 2600 Industrial Trust Bldg., Providence, R. I., Engrs. Estimated cost $1,000,000.

Miss Yazoo City—National Chemical Co. subsidiary of Mississippi Chemical Co., Yazoo City, plans to construct an ammonia plant. Estimated cost $7,500,000.

Mo., Joplin—Thurston Chemical Co., W. R. Thurston, Pres., 102 Wall St., plans to construct an addition to its fertilizer plant. Estimated cost $2,500,000.

N. C., Canton—Champion Paper & Fibre Co., Canton, plans to construct plant additions. Estimated cost $4,000,000.

N. C., Morganton—Great Lakes Carbon Corp., Morganton, plans to construct additions to its plant. Estimated cost $4,500,000.

Tex., Orange—E. I. du Pont de Nemours & Co., Inc., Orange, and Wilmington, Del., plans to expand its production units here. Estimated cost $14,450,000.

Tex., Orange—Foster-Grant Co., Orange and Leominster, Mass., plans to construct styrene monomer units at West Orange. Estimated cost $4,766,000.

Tex., Texas City—Texas City Refining Co., Inc., Texas City, plans to construct 19,000 bbl. capacity houdriflow catalytic cracking unit, including 350 ft. cracking tower. Kaiser Engineers, Inc., 1924 Bway., Oakland, Calif., Engrs. Estimated cost $2,500,000.

Contracts Awarded

Ala., Powderly—Sinclair Refining Co., P. O. Box 1710, Atlanta, Ga., has awarded the contract for a warehouse to Brice Building Co., 1021 2nd Ave., N., Birmingham. Estimated cost $100,000.

Ark., El Dorado—Lion Oil Co., El Dorado, has awarded the contract for refinery additions to Lummus Co., 385 Madison Ave., New York, N. Y. Estimated cost $5,000,000.

Ark., Gum Springs—Reynolds Metals Co., 3rd and Grace Sts., Richmond, Va., will construct an aluminum reduction plant here with separate contracts. Steel has been awarded to American Bridge Co., Roanoke, Va. Estimated cost $30,000,000.

	Current Projects		Cumulative 1952	
	Proposed Work	Contracts	Proposed Work	Contracts
New England	$1,000,000	$150,000	$7,000,000	$2,607,000
Middle Atlantic	.....	86,000	43,450,000	34,040,000
South	16,000,000	31,475,000	274,965,000	190,527,000
Middle West	23,000,000	282,000	58,330,000	108,038,000
West of Mississippi	24,216,000	119,884,000	493,863,000	347,246,000
Far West	.....	128,000	9,728,000	24,907,000
Canada	.....	.....	162,833,000	37,868,000
Total	$64,216,000	$152,005,000	$1,050,169,000	$745,233,000

Calif., Bakersfield—S. A. Camp Cotton Oil Co., Box 1706, has awarded contract for two steel cottonseed storage sheds to Consolidated Western Steel Corp., 5700 S. Eastern Ave., Los Angeles. Estimated cost $128,000.

Ill., Chicago—Bowers Printing Ink Co., 711 West Lake St., has awarded the contract for a factory and office building to Klefstad Engineering Co., 4444 West Montrose St., Chicago. Estimated cost $200,000.

La., Luling—Lion Oil Co., El Dorado, Ark., has awarded the contract for a nitrogen fertilizer plant here to Lummus Co., Milan Bldg., Houston, Tex. Estimated cost $30,000,000.

La., Oak Point—Aronite Chemical Co., Whitney Bank Bldg., New Orleans, La., has awarded the contract for alterations and additions to chemical plant to Gutler Hebert & Co., P. O. Box 8066, New Orleans. Estimated cost $100,000.

Mass., Fitchburg—DeJonge Paper Manufacturing Co., Fitchburg, has awarded the contract for rebuilding its plant recently destroyed by fire to Littlehale & Fisher, 962 Main St. Estimated cost $150,000.

Miss., Canton—Mississippi Federated Cooperatives c/o L. B. Priester & Son, P. O. Box 4456, Jackson, contractors, will construct additions to their fertilizer plant. Estimated cost $100,000.

Miss., Vicksburg—Spencer Chemical Co., Vicksburg, has awarded the contract for a anhydrous ammonia plant unit to Air Products, Inc., Allentown, Pa. Estimated cost $1,175,000.

Mo., St. Louis—Merck & Co., Rahway, N. J., has awarded the contract for a 1 story, 111x201 ft. warehouse to George L. Cousins Contg. Co., 875 North Skinker Blvd., St. Louis.

Mo., St. Louis—L. O. Stocker Co., 3928 Lindell Blvd., contractor-owner will construct a 1 story, 100x160 ft. manufacturing plant and office at 1230 Macklind Ave. to be leased to Inter-Chemical Corp., 1909 Locust St., St. Louis and New York, N. Y.

Mo., St. Louis County—California Spray Chemical Corp., Addie Rd. and Rock Island R. R., Maryland Heights, has awarded the contract for a 1 story 80/140 ft. factory and a 1 story, 30x92 ft. office addition to Merle-Jung, Inc., 5555 West Park Ave., St. Louis.

Neb., Omaha—Cudahy Packing Co., 33rd and N. Sts., has awarded the contract for a pharmaceutical plant building to Mainella Construction Co., 4502 South 36th St. Estimated cost $110,000.

N. J., Vineland—Southern Oxygen Co., Inc., 504 West Blvd., has awarded the contract for a 1 story storage building, loading platform and showroom to E. Finley Mixner, Goshen, N. Y. Estimated cost $86,000.

Okla., Ardmore—Ben Franklin Refining Co., Ardmore, will construct a 5000 bbl. polymerization unit, a 6,500 bbl. catalytic cracking unit and 7,000,000 cu. ft. daily gas concentration unit. Work will be done by force account. Estimated cost $875,000, $770,000 and $550,000 respectively.

Tex., Crane—Phillips Chemical Co., Bartlesville, Okla., will construct additional sulphur recovery plant unit with own forces. Estimated cost $300,000.

Tex., Dallas—Lone Star Gas Co., 1915 Wood St., will enlarge its gas plant. Work will be done with force account. Estimated cost $300,000.

Tex., Ft. Worth—Carpenter Paper Co., 315 East Lancaster St., has awarded the contract for a 1 story, 260x400 ft. warehouse at 1701 Windsor Pl., to O'Rourke Construction Co., 1001 W. Commerce St. Estimated cost $275,000.

Tex., Houston—San Jacinto Chemical Corp. c/o San Jacinto Ordnance Depot, will construct a plant unit to recover nitrogen. Work will be done by owners. Estimated cost $450,000.

Tex., Houston—Plastic & Rubber Products Co., 2100 Hyde Park Blvd., Los Angeles, Calif., will construct a factory with own forces. Estimated cost $179,000.

Tex., Orange—E. I. du Pont de Nemours & Co., Orange, will construct a polythene chemical plant unit. Work will be done by owner. Estimated cost $6,500,000.

Tex., Pickton—Humble Oil & Refining Co., Humble Bldg., Houston, has awarded the contract for a gas compressor plant to Stearns-Roger Manufacturing Co., 1720 California St., Denver, Colo. Estimated cost $1,200,000.

Tex., Seadrift—Carbide & Chemicals Div. of Union Carbide & Carbon Corp., Texas City, has awarded the contract for design and construction of plant for synthetic organic chemicals and plastic resins to Brown & Root, Inc., 4100 Clinton Dr., Houston. Estimated cost $73,000,000.

Tex., Three Rivers—H. W. Bass & Sons, Three Rivers, will construct petroleum products storage facilities. Work will be done by subcontracts and purchase. Estimated cost $128,674

Wis., Milwaukee—Rexford Paper Co., 1715 West Canal St., has awarded the contract for a 1 story, 162x332 ft. factory and warehouse to Klug & Smith, 4425 W. Mitchell St.

SK News

HERE'S HELP IN SCRUBBING GASES OR FUMES

If gases or fumes are a plant problem or if you must satisfy local ordinances regarding air pollution, you will be interested in two types of Gas Scrubbers manufactured by SK.

Both consist of a scrubber box, SK Spray Nozzles, and SK Throat Pieces. The box, which encloses the components, is divided into "banks" as shown in Fig. 4031.

The Fig. 4030 Scrubber is a system rather than a unit since SK supplies the spray nozzles and throat pieces and the customer builds the box from sheet metal, cement, wood, or other material which fits his needs.

The Fig. 4031 Scrubber, illustrated, is a "packaged" unit which includes an integral separator for separating spray liquid after scrubbing.

Both operate on the same principle to handle and wash gases of varying types. As gas enters each bank, it is entrained and forced through the throat pieces into succeeding banks by the spray action of the liquid from the nozzles. High scrubbing efficiency, as much as 98 to 99-plus per cent, can be realized since gas cannot by-pass the spray and thorough mixing occurs. Fig. 4031 illustrates this operation. The number of nozzles, throat pieces, and banks are determined by the volume and characteristics of the gas and the efficiency desired.

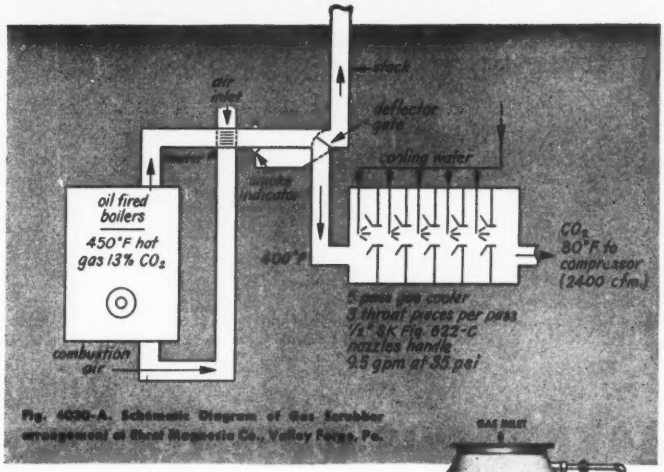


Fig. 4030-A. Schematic Diagram of Gas Scrubber arrangement at Ehret Magnesia Co., Valley Forge, Pa.

Illustration, Fig. 4030-A, shows a system employing an SK Fig. 4030 Gas Scrubber in use at Ehret Magnesia Manufacturing Co.'s new plant at Valley Forge, Pa. This system is being used to wash and cool carbon dioxide gases from oil-fired boilers for later use in the company's magnesia carbonation process.

Complete information on SK Gas Scrubbers is contained in new Bulletin Supplement 4-RA. Request a copy.

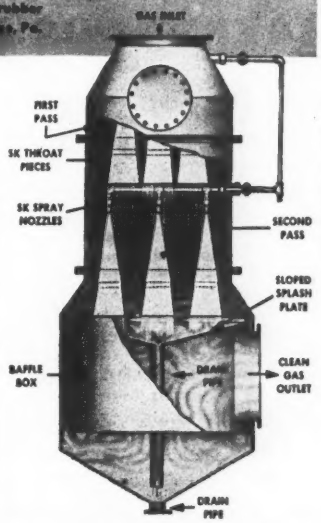
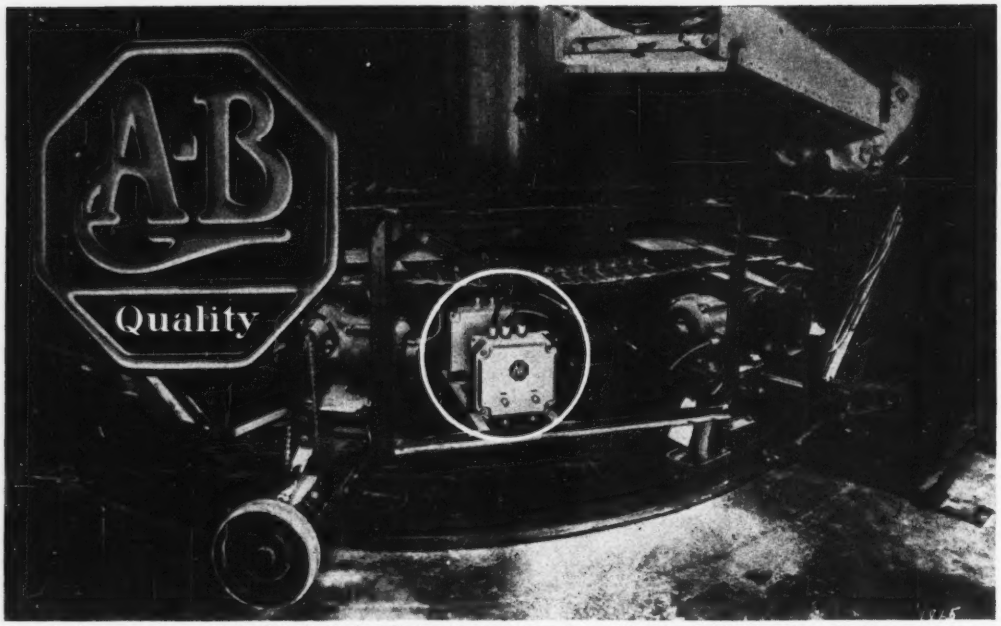


FIG. 4031. SK "Packaged" Gas Scrubber Unit

SK Rotameters are simple, accurate and convenient rate of flow measuring devices designed and built in a variety of types and sizes for diverse applications. Bulletin 18-RA pictures and briefly describes all types of SK Rotameters and lists, by number, the detailed bulletin relating to each. Send for your copy of Bulletin 18-RA today.

Manufacturing Engineers



Boxcar loading conveyors, manufactured by the Manierre Engineering & Machinery Co. of Milwaukee, installed in a flour mill. These conveyors are equipped with A-B Bulletin 705 Automatic Reversing Starters in NEMA 9 Enclosures.

in

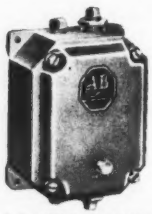
HAZARDOUS DUST LOCATIONS . . .

where you need safe enclosures, install Allen-Bradley Trouble Free Starters

Where explosive grain dust is present, install Allen-Bradley motor controls in NEMA Type 9 Enclosures. Constructed of cast iron with wide machine flanges, these sturdy bolted enclosures provide maximum protection. Allen-Bradley solenoid starters are ideal for bolted enclosures . . . their simple design, only ONE moving part, guarantees millions of trouble free operations. Furthermore, their double break, cadmium silver alloy contacts require no maintenance; hence the cover need not be taken off for contact inspection—a time- and moneysaving feature in starters with bolted enclosures. Dependable overload relays, easily reset without opening the starter cabinet, provide reliable, accurate overload protection. Allen-Bradley has a safe enclosure for every kind of job . . . wet, hazardous, dusty, corrosive.

Allen-Bradley Co., 1337 S. First St., Milwaukee 4, Wis.

In Hazardous Dust Locations Protect Men and Equipment with NEMA 9 Enclosures . . .



Bulletin 709 Solenoid Starter in NEMA 9 Enclosure.

Allen-Bradley Bulletin 713 Combination Starter in a NEMA 9 Enclosure for hazardous dust locations. A-B Combination Starters are interlocked, and the operating handle has three positions to make it foolproof.

One of a broad line of Allen-Bradley Bulletin 800 Heavy Duty Push Buttons.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

HOW DU PONT ORLON HELPS INDUSTRY

ORLON CUTS ANNUAL WORK-CLOTHES COSTS 80%

Exposed to battery acid, the uniform on the man on the left developed ruinous holes in a month's time. The man on the right works under the same acid conditions, is wearing lighter-weight, better-looking clothes . . . yet his uniform has been in use for a year. And there's no doubt that it will last for a considerably longer time. He is dressed in work clothes of "Orlon" acrylic fiber, the new Du Pont fiber that has acid-resistance as one of its outstanding properties.

Gates Factory Store, Inc., of Denver, Colorado—one of the largest retail battery stores in the country—has reduced work-clothes costs 80% by switching over to uniforms of "Orlon." In re-outfitting its staff of forty battery workers in "Orlon," the company is saving $3,000 this year.

Working with acids may not be a problem in your company, but your business, too, may benefit from the unique combination of properties found in "Orlon." The weather-resistance, wrinkle-resistance and easy launderability of work clothes of "Orlon" suggest uses in industries even where deteriorating chemical conditions do not exist. And the usefulness of "Orlon" extends beyond work-clothing applications; the fiber is being used presently in pneumatic filtration bags, hydraulic press cloths and awning materials, too.

"Orlon" resists the damaging effects of heat and sunlight, as well as acids; it has high strength, wet or dry; and good durability and stretching resistance. Find out how "Orlon" can help you in your business. Write E. I. du Pont de Nemours & Co. (Inc.), Textile Fibers Dept., Room N-2504-C, Wilmington 98, Delaware.

"Orlon" is Du Pont's trade-mark for its acrylic fiber.

Many manufacturers make fabrics of "Orlon" acrylic fiber . . . made and supplied to them by Du Pont. Look for its extra values in more and more products for industry.

DU PONT

REG. U. S. PAT. OFF.

150th Anniversary

BETTER THINGS FOR BETTER LIVING

. . . THROUGH CHEMISTRY

A Headline that is also a Helpline!

1 BUFLOVAK OFFERS PROFITABLE COOPERATIVE ASSISTANCE

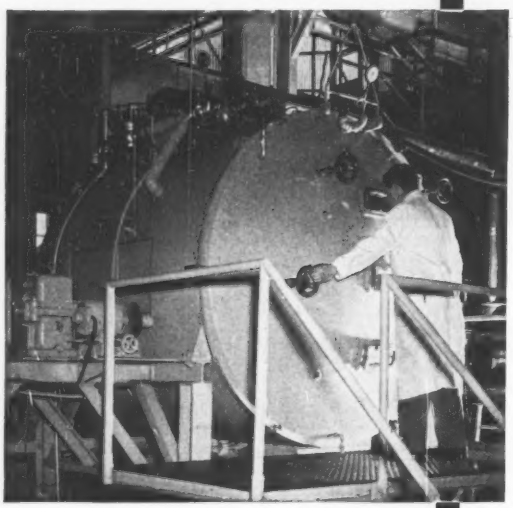
2 IN ITS RESEARCH AND TESTING LABORATORIES

3 . . . A PRE-TESTING SYSTEM THAT HAS SOLVED 6500 PROCESSING PROBLEMS

4 IN THE CHEMICAL, FOOD AND PHARMACEUTICAL FIELDS

●

Low-temperature drying for heat-sensitive products is performed on this sanitary type Stainless Steel Vacuum Double Drum Dryer installed in the BUFLOVAK Laboratory.



1 BUFLOVAK Research Laboratories and Testing Plant are maintained for your use . . . to help you solve problems in drying, evaporation, extraction, solvent recovery, crystallization, and food processing.

2 Completely equipped with pilot plant equipment for low-temperature evaporation and drying, and other advanced processes that lead to improved operations.

3 Here tests can be completed, ranging from a few beakers of precious material to tank-car quantities requiring round-the-clock operation on a production scale. Results are definite! Production data is accurate! BUFLOVAK'S pre-testing has given the right answer to more than 6500 processing problems!

4 Many new methods, highly profitable to their users, have been developed for use in the Chemical, Food and Pharmaceutical fields.

Your investment in BUFLOVAK equipment can be safeguarded by pre-testing your product to prove at the start whether you are on the right track to profits.

Write for complete information.

BUFLOVAK BUILDS

EVAPORATORS
Low-Temperature
By-Product Recovery
Chemicals
Food Product
Crystallization

DRYERS
Vacuum Double Drum
Vacuum Rotary

Pilot Plant
Atmospheric

PROCESSING KETTLES
Mixers
Impregnators
Dopp Kettles

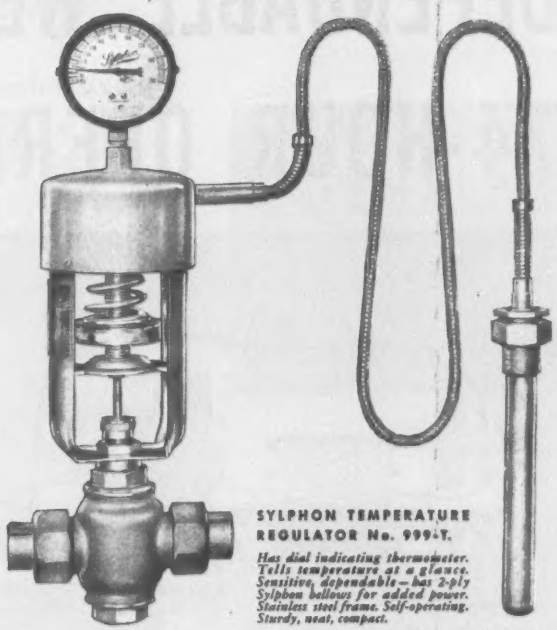
Solvent Recovery & Distillation Equipment

SEND FOR CATALOGS

Buflovak Equipment

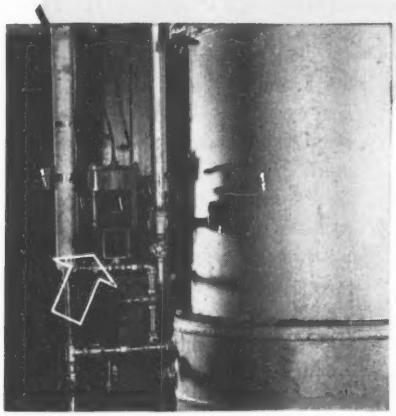
DIVISION OF BLAW-KNOX CO.
1549 FILLMORE AVE., BUFFALO 11, N. Y.

"Born" 48 years ago ...grew up with the chemical industry!



SYLPHON TEMPERATURE REGULATOR No. 999-T.

Has dial indicating thermometer. Tells temperature at a glance. Sensitive, dependable—has 2-ply Sylphon bellows for added power. Stainless steel frame. Self-operating. Sturdy, neat, compact.



Typical application in chemical industry—Sylphon Regulator on a vacuum still.

The Sylphon Regulator pictured here, No. 999-T—one of our latest—has new advantages that help you get simpler, more accurate temperature control.

And you may be surprised to know that this exceptional control had its "start" 48 years ago!—when the Sylphon Seamless Metal Bellows was developed. That mechanical marvel made possible many of the first regulators used for accurately controlling temperature or pressure in the chemical industry. Some Sylphon controls have been on the job faithfully for 25 years and more.

No. 999-T is a typical example of the constant improvement and broadening of the Sylphon line—a line of controls that serves practically all industries. Today, they do all kinds of jobs in industrial processing control, and in heating, ventilating and air conditioning. They'll do tomorrow's jobs, too, whenever they're called upon.

Perhaps one or more of the many Sylphon controls may help you improve your operations—cut costs, too. Let us help you with your requirements or problems. Just write Dpt.NC-A.

FIRST WITH BELLOWS

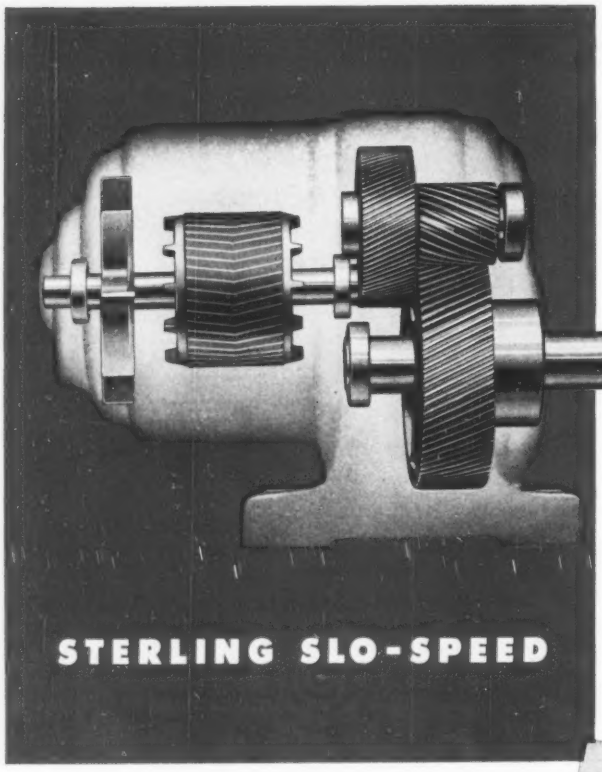
Temperature Controls • Bellows Devices • Bellows Assemblies

FULTON SYLPHON
DIVISION

ROBERTSHAW-FULTON CONTROLS CO., KNOXVILLE 4, TENN.

Canadian Representatives, Darling Brothers, Montreal

DEPENDABLE WEATHERPROOF 24-HOUR OPERATION WITH



STERLING SLO-SPEED!

For continuous 24 hour outdoor service, the Dorr Co. selects Sterling totally-enclosed, non-ventilated Slo-Speed Electric Power Drives. The Slo-Speeds installed on the Dorr Sifeed Clarifier Units at Lederle Laboratories, American Cyanamid Co., in New York, are giving highly satisfactory service under all weather conditions, states Mr. A. J. Lantelme of the Dorr Co., Stamford, Conn.

STERLING SLO-SPEED GIVES YOU THE ONE BEST LOW SPEED AND

gives uninterrupted service—carries heavy overhung loads—provides versatile mounting and flexibility in arrangement of machinery—saves valuable space—provides greater safety—costs less to install and use. An indispensable source of low speed power for:

Agitators	**Dryers**	**Presses**
Blenders	**Feeders**	**Pumps**
Blowers	**Kilns**	**Screens**
Conveyors	**Mills**	**Tumblers**
Cookers	**Mixers**	**Etc., etc.**

OTHER STERLING ELECTRIC POWER DRIVES:
- STERLING SPEED-TROL (VARIABLE SPEED) MOTORS
- STERLING KLOSD AND KLOSD-TITE (NORMAL SPEED) MOTORS

DRIP-PROOF • SPLASH-PROOF • TOTALLY ENCLOSED

70 ILLUSTRATIONS showing how Sterling Electric Power Drives reduce production costs. Write for Bulletin No. D-119

OUTSTANDING FEATURES:

Simplified gear system—balanced design—compact—rugged—highly efficient—abundant lubrication—low output shaft—positive oil seals—Herringbone Rotor—protected—streamlined—direct through ventilation—quiet operation—AGMA speeds—extremely long life—every unit will operate in any position

STERLING ELECTRIC MOTORS

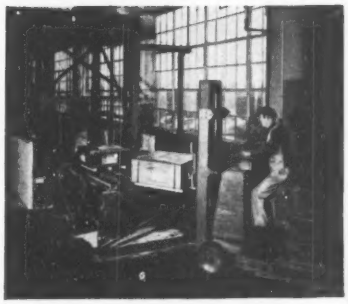
Plants: New York City 51; Van Wert, Ohio, Los Angeles 22; Hamilton, Canada; Santiago, Chile

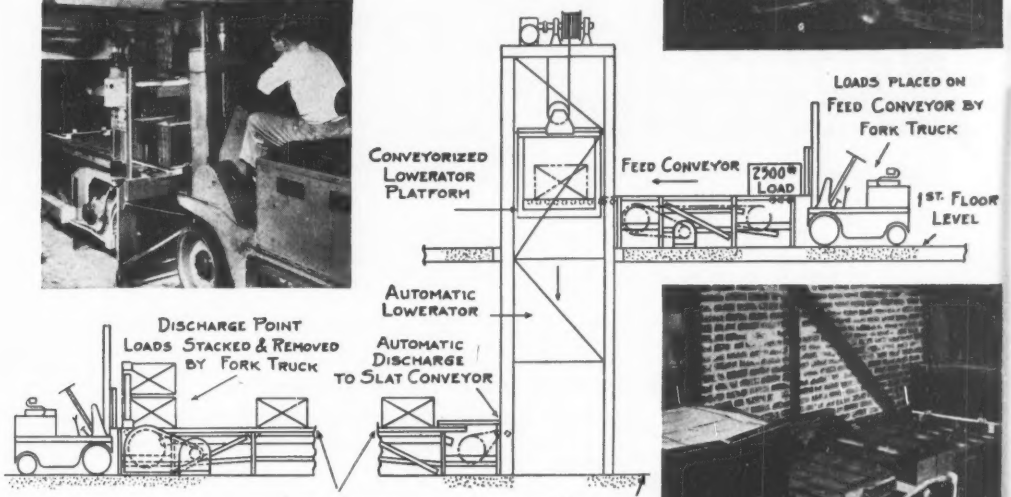
Offices and distributors in all principal cities.

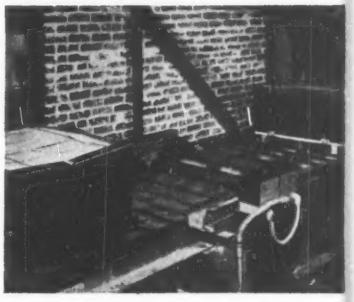
only through *Engineering*
can *Efficiency* be achieved...

up 87½%

for department of a
LARGE EASTERN CAN COMPANY*







Like many foresighted manufacturing companies of today, this large eastern can manufacturing company, is constantly aware of in-plant materials handling as a majo. operating cost. The diagram and pictures present Gifford-Wood's solution to their problem of handling materials to storage. Long, empty return runs of the fork trucks used was only one aspect of the previous method of operation which was unduly expensive. Through the new G-W System, 2500-lb. bundles of steel sheets which formerly required eight hours to unload and store are now handled in one!

Working with Wigton-Abbott Corporation, Consulting Engineers, Gifford-Wood applied the materials handling knowledge for the solution of a costly problem—and this is only typical of many such engineered installations. All elements of such an installation (length of horizontal conveyor travel, raising or lowering to floors above or below, etc.) are, of course, designed to best suit the particular conditions encountered.

The G-W Materials Handling Engineer in your area will be glad to discuss the most economical means of materials flow in your plant. Call on him —it may well be the first step toward higher profits through lower operating and maintenance costs.

**Company name available on request.*

GIFFORD-WOOD CO.

Since 1814 • Hudson, New York

NEW YORK 17, N. Y. 420 LEXINGTON AVE. | ST. LOUIS 1, MO. RAILWAY EXCHANGE BLDG. | CHICAGO 6, ILL. 565 W. WASHINGTON ST.

B-6307

When you think of materials handling—Think of Gifford-Wood

BUY POLYOLS ON FACTS... Compare all four

FACT ***Sorbitol leads in Non-Volatility***

Sorbitol stays put: it is non-volatile. Sorbitol improves the shelf-life of cork, paper, gaskets, cosmetics, tobacco, and many other products.

FACT ***Sorbitol leads in Economy and Price Stability***

On price alone, sorbitol rates the "best buy" in polyols. Its price trend through the years has been downward. Still another price reduction has been made recently. Ask about it.

FACT ***Sorbitol leads in Availability***

Sorbitol, derived from sugar, is available in almost unlimited quantities. You don't need to worry about shortages of sorbitol or its derivatives.

Write today for the valuable 22-page Atlas sorbitol book containing charts, usage tables, and other helpful data. Personal technical assistance is available at your request.

ATLAS

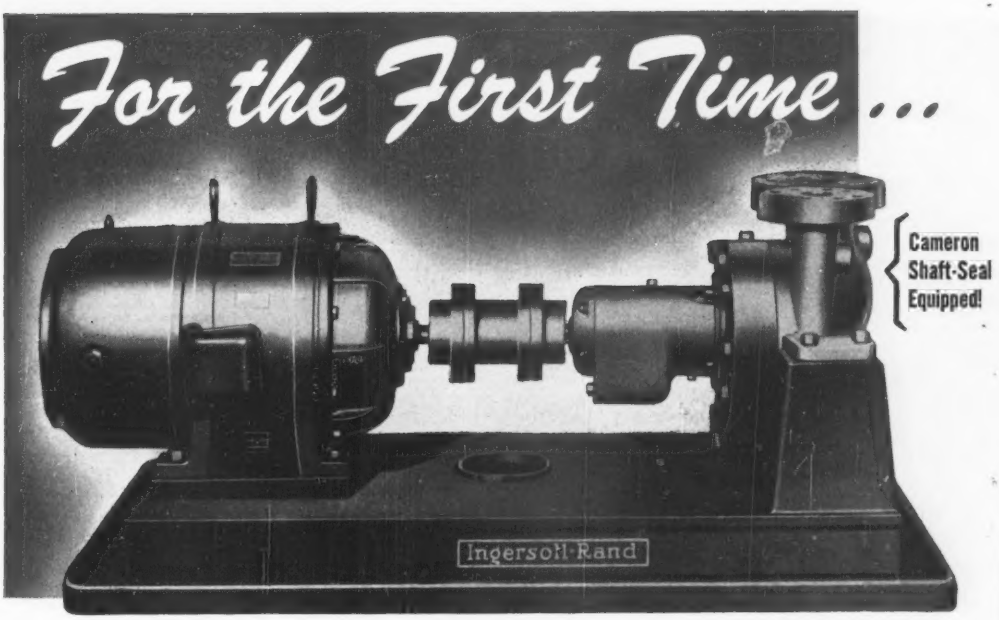
Industrial Chemicals Department

ATLAS POWDER COMPANY

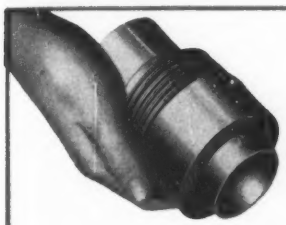
WILMINGTON 99, DELAWARE • OFFICES IN PRINCIPAL CITIES

ATLAS POWDER COMPANY, CANADA, LTD., BRANTFORD, CANADA

For the First Time...



A REFINERY AND PROCESS PUMP DESIGNED AROUND A MECHANICAL SEAL



CAMERON SHAFT-SEAL
The answer to tough stuffing box problems.

A stationary sealing face of carbon and a rotating seal ring of stellited steel constitute the heart of the Cameron Shaft-Seal. Balanced sealing areas control contact pressure between the sealing faces, effectively preventing leakage without undue wear of the rotating fit. In difficult sealing jobs, the Shaft-Seal succeeds where complicated packed stuffing box arrangements have failed.

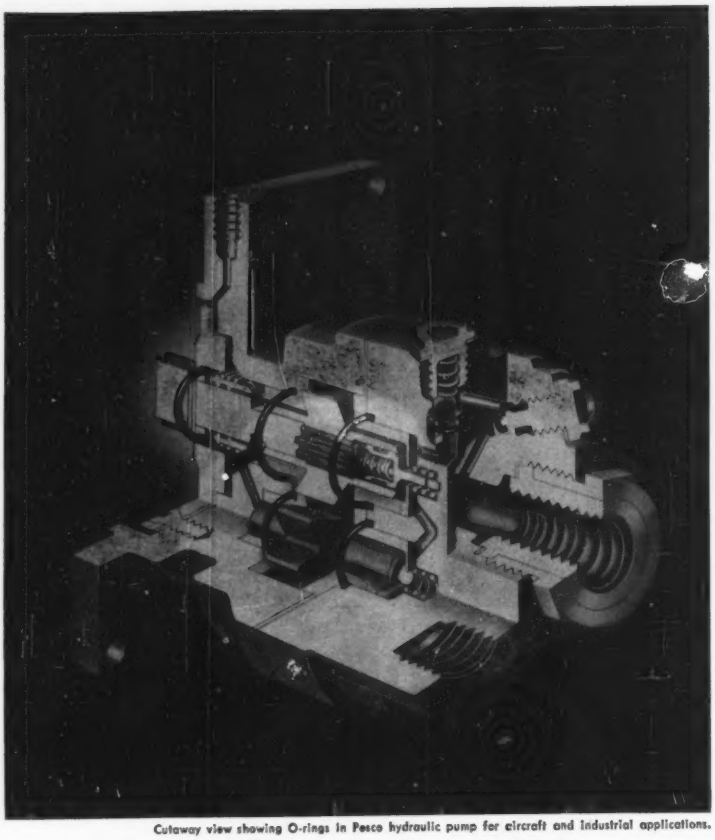
Built-in Cameron Mechanical Shaft-Seal reduces liquid losses and stuffing box maintenance in this SFLA pump line!

The Cameron Shaft-Seal is an Ingersoll-Rand development that has demonstrated its dependability in thousands of process installations the world over since its introduction in 1928. Now, this same Shaft-Seal is built-in as an integral part of these pumps—*at no extra cost.* Use of the Shaft-Seal efficiently stops liquid losses and reduces stuffing box attention to a minimum.

Designed for handling light refinery liquids at moderate temperatures, SFLA-MFLA-HFLA pumps are built in five sizes from 1 to 4 inches for low, medium and high head applications. Top discharge is standard, with top or end suction nozzles available. Capacities to 1000 gpm and pressures to 600 psi. Write, or ask your Ingersoll-Rand representative for full details.

Ingersoll-Rand
Cameron Pump Division 699-10
11 Broadway, New York 4, N. Y.

COMPRESSORS • CONDENSERS • ROCK-DRILLS • AIR & ELECTRIC TOOLS • PUMPS • GAS & DIESEL ENGINES



Cutaway view showing O-rings in Pesco hydraulic pump for aircraft and industrial applications.

Simplified Leakproof Seals

WITH PARKER O-RINGS

THIS IS IT

Cross section drawing of O-ring in groove, sealing under pressure.

PARKER synthetic rubber O-rings are simple to use, simple to replace. They require no complicated product design . . . a simple groove is all that is needed. Economical in first cost, they provide perfect, leakproof sealing with economy of weight and space . . . can be used in moving and non-moving applications.

PARKER is the one source for all standard O-rings to meet specifications covering fuel, hydraulic and engine oil services . . . and for special service O-rings of tested and approved compounds. Your Parker O-ring distributor listed at the right will give you Catalog 5100 . . . or write direct to The PARKER Appliance Company, 17325 Euclid Avenue, Cleveland 12, Ohio.

Parker

TUBE FITTINGS • VALVES • O-RINGS

Plants in Cleveland • Los Angeles • Eaton, Ohio • Berea, Ky.

Parker

O-RINGS

ARE STOCKED BY THESE AUTHORIZED DISTRIBUTORS

AKRON, O.
B. W. Rogers Co.
850 So. High St., Akron 9, Ohio

BOSTON, Mass.
Irving B. Moore Corp.
65 High Street, Boston, Mass.

BUFFALO, N. Y.
Hercules Gasket & Rubber Co.
327 Washington St., Buffalo 3, N. Y.

CHICAGO, Ill.
Air Associates, Inc.
5315 W. 63rd St., Chicago 38, Ill.
Shields Rubber Co.
108 N. Clinton St., Chicago 6, Ill.

CLEVELAND, O.
Cleveland Ball Bearing Co.
3865 Carnegie Ave., Cleveland, Ohio
Neff-Perkins Co.
1360 West 9th St., Cleveland 13, Ohio

DALLAS, Tex.
Air Associates, Inc.
3214 Love Field Dr., Dallas 9, Tex.
Metal Goods Corp.
6211 Cedar Springs Rd., Dallas 9, Tex.

DENVER, Colo.
Metal Goods Corp.
2425 Walnut St., Denver 2, Colo.

DETROIT, Mich.
J. N. Fauver Co.
49 West Hancock St., Detroit 1, Mich.

FORT WORTH, Tex.
Adco Industries
3414 Camp Bowie Blvd.
Fort Worth 7, Tex.

HOUSTON, Tex.
Metal Goods Corp.
711 Milby St., Houston 3, Tex.

KANSAS CITY, Mo.
Metal Goods Corp.
1300 Burlington Ave.
N. Kansas City 16, Mo.

LOS ANGELES, Calif.
Aero Bolt & Screw Co., Inc.
1071 Arbor Vitae Ave.
Inglewood, Calif.
Synthetic Rubber Products Co.
1538 South Eastern Ave.
Los Angeles 22, Calif.

MIAMI, Fla.
Air Associates, Inc.
International Airport, Miami, Fla.

MILWAUKEE, Wis.
Allrubber Products & Supply Co.
612 So. Second St., Milwaukee 4, Wis.

MINNEAPOLIS, Minn.
Van Dusen Aircraft Supplies, Inc.
2004 Lyndale Ave., South
Minneapolis 5, Minn.

NEW ORLEANS, La.
Metal Goods Corp.
432 Julia St., New Orleans 13, La.

NEW YORK, N. Y.
Durham Aircraft Service Co.
5615 Northern Blvd., Woodside, N. Y.
Nielsen Hydraulic Equipment, Inc.
298 Lafayette St., New York 12, N. Y.

PHILADELPHIA, Pa.
Goodyear Supply Co.
1506 Latimer St., Philadelphia, Pa.

PITTSBURGH, Pa.
Shields Rubber Co.
137 Water St., Pittsburgh 22, Pa.

PORTLAND, Ore.
Hydraulic Power Equipment Co.
2316 N. W. Savier St., Portland 10, Ore.

ST. LOUIS, Mo.
Metal Goods Corp.
5239 Brown Ave., St. Louis 15, Mo.

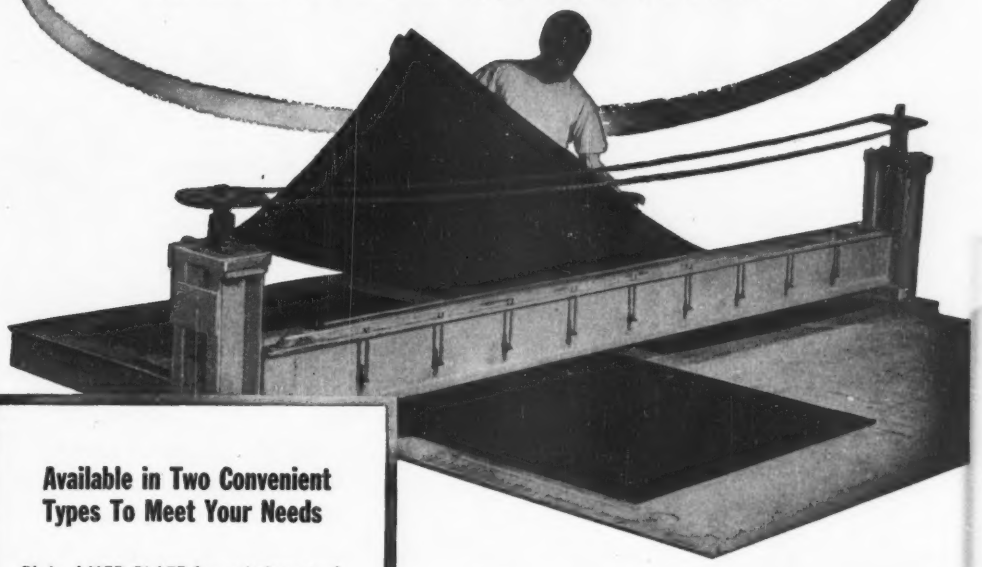
TULSA, Okla.
Metal Goods Corp.
302 North Boston, Tulsa 3, Okla.

WICHITA, Kan.
Standard Products, Inc.
650 E. Gilbert, Wichita 11, Kan.

CANADA
Railway & Power Engineering Corp., Ltd.

FOR THOSE EXTREMELY CORROSIVE CONDITIONS...

CONSIDER THE USE OF *Amer-Plate*



Available in Two Convenient Types To Meet Your Needs

Plain AMER-PLATE for existing steel or concrete tanks or structures

Plain Amer-Plate is smooth and flat on both sides. It is applied to existing surfaces using specially developed cements that provide a firm bond with those surfaces.

T-LOCK AMER-PLATE for newly cast concrete pipe and structures

T-shaped parallel "anchors" are an integral part and extend along the back of each Amer-Plate sheet. The sheet is applied to the inner forms of tanks, concrete pipe, and structures. When the concrete is poured, the tees are embedded and locked into the concrete.

HERE'S A NEW, EXTRA-TOUGH, ECONOMICAL INDUSTRIAL SHEET LINING

Especially designed to protect against extremely corrosive conditions, Amer-Plate is particularly adaptable for use in highly corrosive sewers, chemical storage tanks, tank cars and tank trucks hauling unusually corrosive solutions.

Composed of inert resins and plasticizers, Amer-Plate is impervious to gases, highly resistant to acids, alkalies, alcohol, oils, salts, and petroleum products. It has a very low moisture vapor transmission rate, will not support combustion, and contains no toxic materials.

Amer-Plate is a flexible thermoplastic sheet, practical for application to flat, curved and angular surfaces. Its economy and effectiveness has been proved in the field in over 10 years of development and testing.

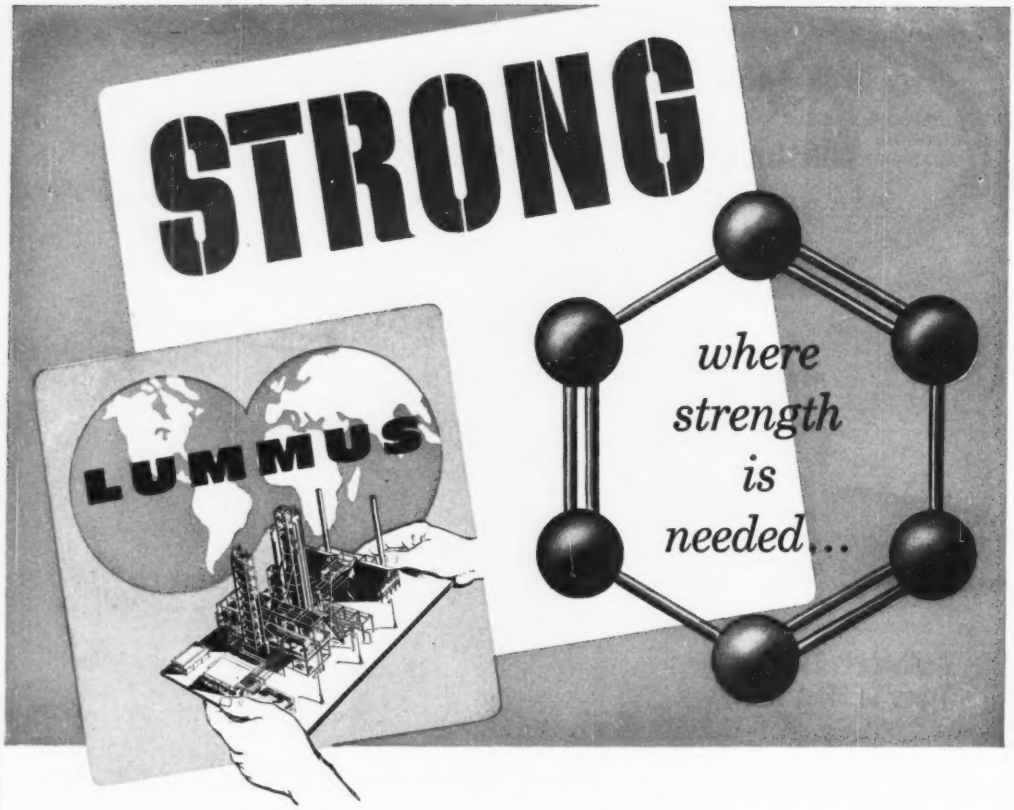
So... wherever you require long lasting protection against extreme corrosion, make a full investigation of the possibility of using Amer-Plate. Write for complete information.

Amer-Plate industrial sheet lining is the result of many years experience in the manufacture and application of Amercoat protective coatings.

AMERCOAT CORPORATION

A division of American Pipe and Construction Co.

4809 Firestone Blvd., South Gate, California



The Lummus Company has played an integral and important role in the unfolding story of chemical progress.

Evidence? You'll find it all over the globe in the form of chemical processing units designed, engineered and constructed by The Lummus Company—plants whose initial run met or exceeded design capacity and never relaxed in performance.

Examples? Lummus has designed and built nearly 350 chemical processing units, included among which are plants for producing phenol, resins, solvents, asphalts, alcohol, acetone, toluol, ammonium picrate, and for manufacturing catalysts. We were at the forefront in providing huge styrene and butadiene plants to feed the vast synthetic rubber program. In providing ethylene manufacturing facilities, the name Lummus looms biggest of all.

May we suggest our symbol as a good one to look for, believe in, and rely on in connection with your next chemical processing project? You'll find us to be a group with the depth of chemical engineering talent and the breadth of experience to tackle engineering and construction problems anywhere in the world.

THE LUMMUS COMPANY

385 MADISON AVENUE, NEW YORK 17, N. Y.

HOUSTON • CHICAGO • LONDON • PARIS • CARACAS

DESIGNING ENGINEERS AND CONSTRUCTORS FOR THE PETROLEUM AND CHEMICAL INDUSTRIES

Dependable Source for Chemical Raw Materials

1 *Add equal amounts of your product to each jar.*

2 *Add small quantity of Carbose to one and dissolve.*

3 *Add carbon suspension to each jar.*

4 *Place a cloth swatch in each.*

5 *Cap jars and shake for 10 seconds.*

6 *Withdraw swatches.*

7 *Place swatches in rinse water.*

8 *Rinse by shaking for 5 seconds.*

9 *Remove swatches . . . and COMPARE!*

Make Wyandotte's 2-minute Soil Deposition Test yourself. See what Carbose can do for *your* detergent product!

BULLETIN BOARD

***Dicol**:**
This mixture of diglycols, predominantly diethylene glycol, has shown outstanding efficiency in plasticizing and humectant applications . . . plus up to 20% savings! Write for samples, data.

Purecal:
Recent advances in GR-S compounding and processing, using this whitest pigment extender known (Wyandotte's precipitated calcium carbonate) warrant cost comparison with cheapest natural-rubber formulas. Other profitable applications: paint, paper, ink manufacture.

Caustic Soda:
Some cleaning compound manufacturers are finding that powdered caustic has some advantages over flake. Since other ingredients are powdered or fine-granular, a dust-suppressing oil is needed anyway; and **the powdered caustic does not tend to segregate.** Ask for trial quantity.

Soda Ash:
Supply of soda ash is adequate for the present; and we're expanding production to meet growing needs of old and new customers.

ONE PERCENT Wyandotte Carbose improved detergency up to 40%!

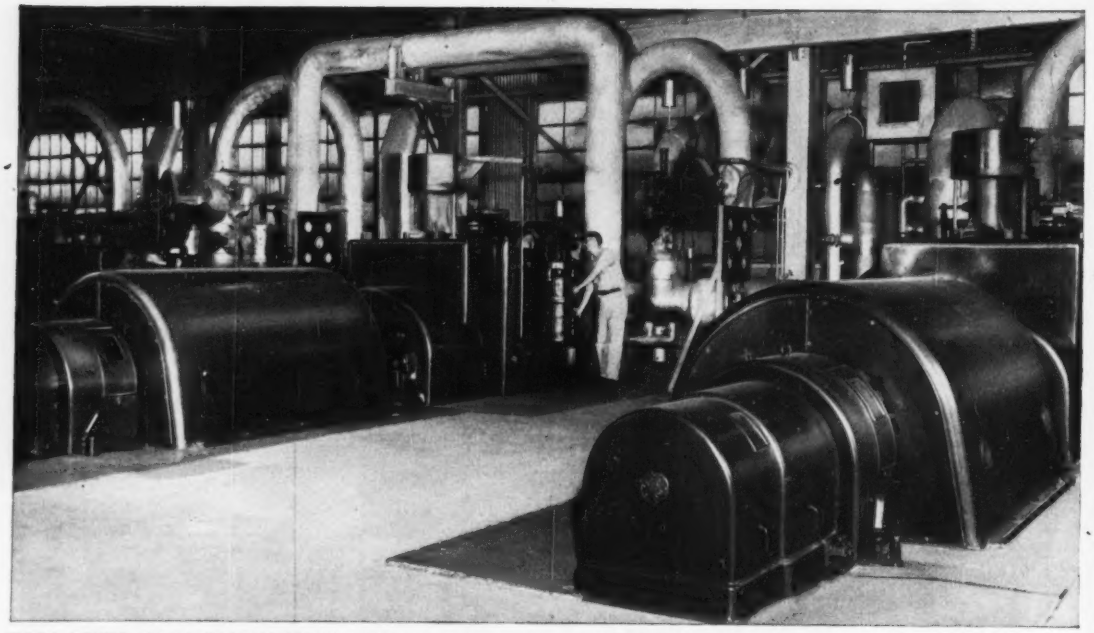
Reduction in the cost of raw materials as high as 50% by use of CARBOSE* formulations . . . that's the kind of report we're getting on CARBOSE from the field!

It's no surprise. In carefully controlled tests on cotton, this outstanding "detergency promoter"—as little as 1%—*increased soil removal and whiteness retention as much as 10% to 40%* in different formulations with synthetic detergents and builders. CARBOSE promotes long-lasting suds, reduces skin irritation—ideal for dishwashing, car-washing and other compounds where emolliency is desirable.

This superior product is typical of Wyandotte. For the quick facts on current production, improvement and development of other Wyandotte chemicals for the process industries, read the "Bulletin Board," left. For samples with which you can make the above test yourself or for more complete information, write—*Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in Principal Cities.*

*REG. U.S. PAT. OFF.

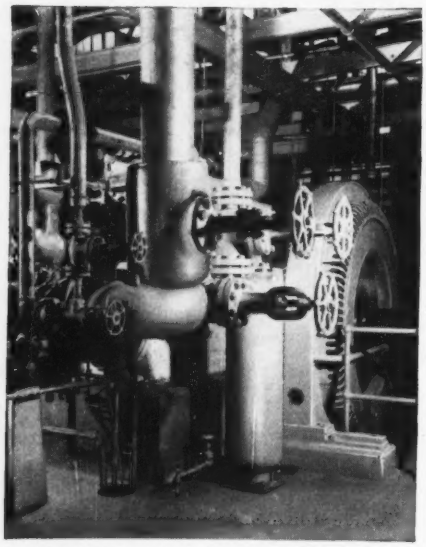
Wyandotte
CHEMICALS
HEADQUARTERS FOR ALKALIES



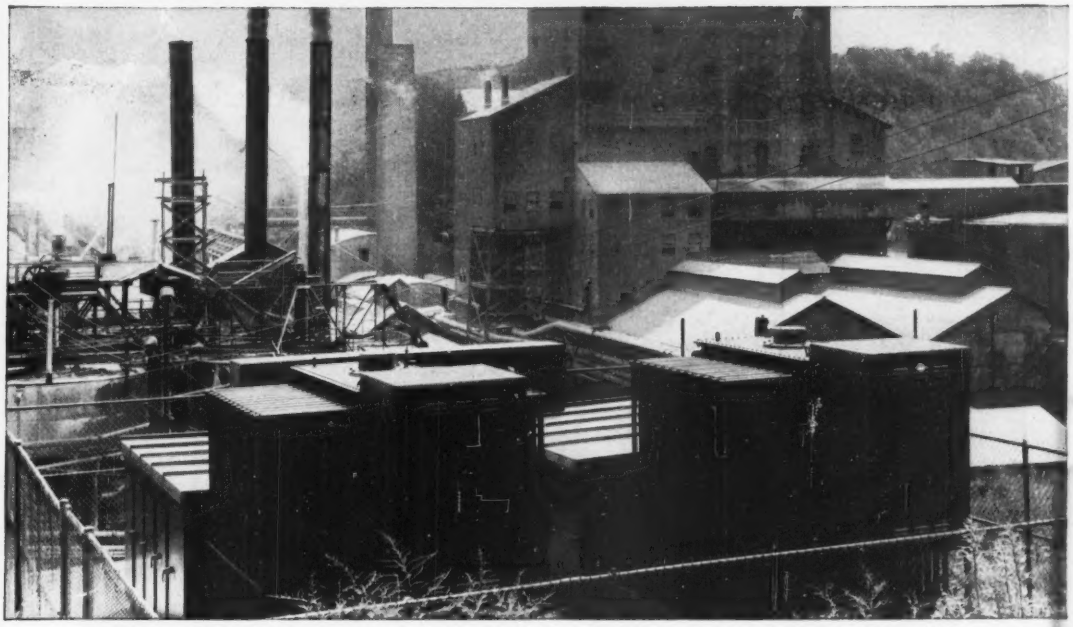
EXTRA POWER, EXTRA PROCESS STEAM is delivered by these 13,800-volt G-E turbine-generators. They utilize steam with high efficiency. Together with other turbine-generators in the plant, they furnish the electric power and all of the plant's process steam.

How alkali plant saves 2 ways

COMPACT, METAL-CLAD G-E SWITCHGEAR in power plant at Saltville was easy to install, has saved inspection and maintenance time.

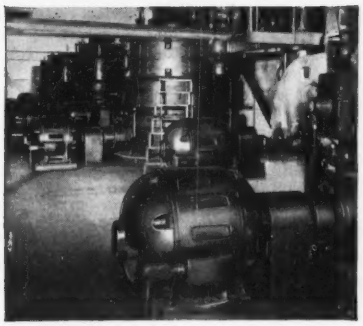


PEAK DRIVE EFFICIENCY in "dry-ice" building is provided by five 2300-v G-E synchronous motors that drive compressors.



TO REDUCE COST of feeders, transformers, and switchgear at Saltville, and to cut power losses, power is distributed at high voltage. Two of the G-E unit substations in foreground step down 13,800 volts to 2300 volts for plant distribution.

with high-voltage power system



HEAVY DUTY 75-hp Tri-Clad* motors drive coal pulverizers. Typical of many such drives in the plant.

Registered trade-mark of General Electric Company

Mathieson's Saltville, Va. plant reduces line losses, cuts equipment costs with 13.8-kv power system

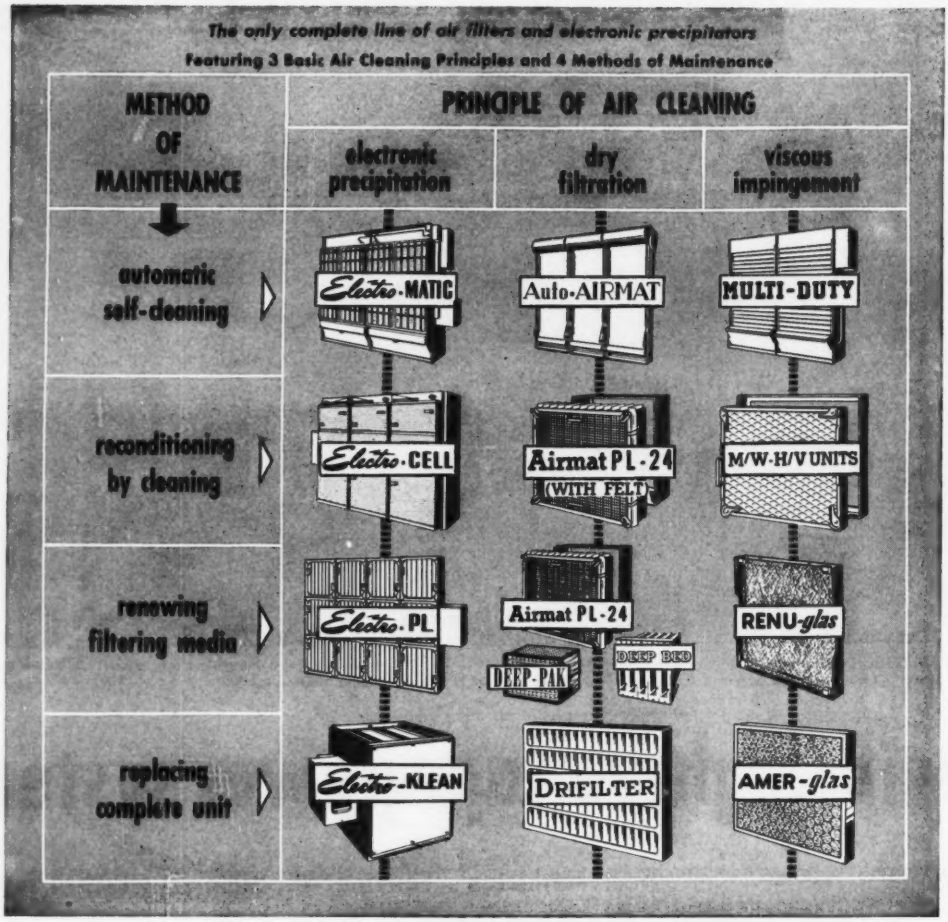
Each step in the electrical system of Mathieson's Saltville plant—generation and utilization—takes advantage of high-voltage power distribution.

Electricity generated by turbine-generators at 13,800 volts is distributed to the various utilization areas where it is stepped down in compact load-center unit substations. The need for long low-voltage feeders is ended. Voltage drop is lessened. Plant efficiency is increased. Installed cost of the plant's electrical system is lower.

Integrating the Saltville plant's power system—planning it to function as one efficient unit—was the job of General Electric system engineers. They can provide the co-ordination you need for highest over-all electrical system performance. Contact your G-E Apparatus Sales representative early. *General Electric Company, Schenectady 5, N. Y.* 662-39

Engineered electrical systems for chemical plants

GENERAL ELECTRIC



CLEAN AIR FOR CHEMICAL PROCESSES

...Select from the ONLY COMPLETE LINE of air cleaning products

Engineered air cleaning equipment is the practical answer for today's complex problems of air contamination. This is the advantage offered by AAF's complete line, which includes more than twelve distinct air filter types. These range from the highly technical electronic precipitator to simple replaceable units . . . many of them being exclusive AAF developments. Each type is distinguished by its principle of cleaning air or method of maintenance, thus allowing the engineer wide latitude in selection to meet individual requirements.

If you require *clean air* . . . look to AAF for the most practical and efficient answers. AAF representatives located in all major cities will be glad to serve you, or write us for our new 32-page "Composite Catalogue"—American Air Filters—Bulletin 510.

AAF

American Air Filter
COMPANY, INC.

325 Central Avenue, Louisville 8, Kentucky

American Air Filter of Canada, Ltd., Montreal, P. Q. • Pacific Division Office, San Francisco, Cal.

what you want in an oxidant . . .

is a question only *you* can answer

Welsbach Ozone may be the right solution . . . not only as a replacement for ordinary oxidants in present processes but as an aid in the development of new and better products, at a lower cost.

It's easy to check Welsbach Ozone's versatility and efficiency . . . and its *value* in your process . . . in the laboratory. The Model T-23 Laboratory Ozonator can give you enough data to prove that Ozone is dependable and that it will build your profits because it lowers costs.

Welsbach Ozone is a new tool for industry . . . and industry is finding it to be the answer to many of its oxidation problems. It offers the unique properties of ozone as an oxidant . . . an oxidant actually delivered to the point of use with no full-time supervision or labor necessary, with operating costs constant and predictable and maintenance costs negligible! Add to that these *extra* dividends—no procurement problems, no materials handling and no storage expense.

Certainly Welsbach Ozone *is* the oxidant of choice. But prove it for yourself—test its value and versatility in your own plant . . . in your own laboratory. It's a new tool—finely sharpened to cut *your* costs—but only you can put it to work—for you!

Investigate the potential of WELSBACH OZONE

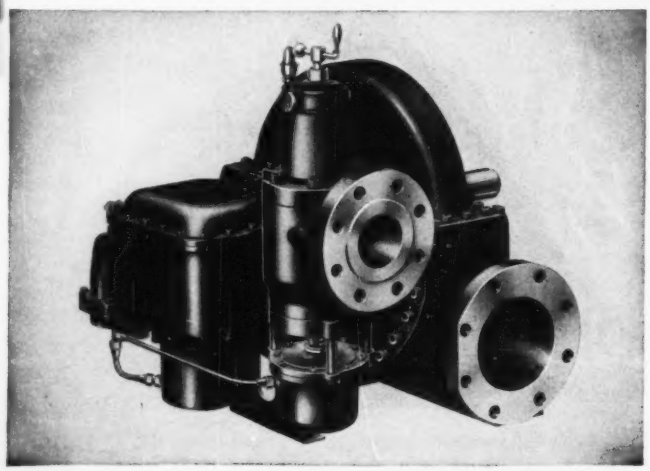
THE WELSBACH CORPORATION

OZONE PROCESSES DIVISION

2409 W. Westmoreland Street, Philadelphia 29, Pa.

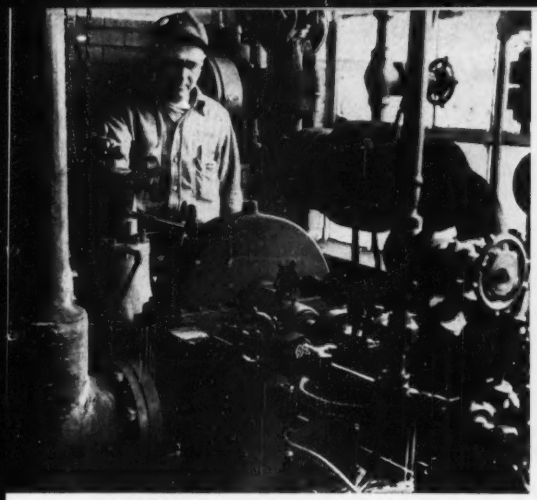
Pioneers in Continuing Ozone Research

Mr. A. Bourgeois, process foreman at Sohio Refinery, adjusts pump valve. Type DP-20, 125 hp turbine increased by 75% the oil thru-put of this pump which supplies crude oil for the distillation unit.



Type DP MECHANICAL-DRIVE TURBINE

This Type DP turbine is one of General Electric's line of mechanical-drive turbines designed for driving pumps, compressors, blowers, etc. Their sturdy construction and many safety features make them ideal for industries having process steam requirements.



At Sohio's Toledo Refinery, this 15 hp, Type DP-16 turbine with non-sparking enclosed overspeed governor, safely pumps propane in an explosive atmosphere.

Mr. Eugene Ten Eyck and Mr. E. J. Bissonnette of Sohio Refinery discuss stocking of interchangeable parts for the Type DP turbines installed at the Refinery.

Sohio Refinery picks G-E turbine drives to increase oil thru-put

Engineers at Sohio's Toledo Refinery installed two G-E mechanical-drive turbines to help eliminate a bottleneck in refinery operations. A General Electric Type DP-20 turbine increased oil thru-put on one pump at Sohio by 75%, when it replaced older drive equipment. Total daily thru-put of the one pump now equals the former capacity of two pumps.

INSTALLED IN HAZARDOUS AREA

Sohio also installed a G-E Type DP-16 turbine in an explosive atmosphere to pump almost pure propane. The enclosed, non-sparking overspeed governor and the positive trip-throttle valve (which shut off all steam flow in case of overspeed) reduce hazards in this area. The turbine, which operates twenty-four hours per day, has required no maintenance during its first year of service.

VIBRATION REDUCED

Replacement of previous drive equipment with a G-E turbine now assures longer life to other machinery in the area. For G-E turbines with their center-line support and rigid assembly of buckets are now contributing to smooth operation at the refinery.

INTERCHANGEABLE PARTS

Use of G-E standard turbines can make stocking of spare parts a simple matter—most replacement parts are interchangeable among various frame sizes of G-E Type DP turbines. Stocking costs are cut, yet parts are available when needed.

This same parts standardization adds to the turbine's flexibility—often the turbine can be adapted to a new plant application with only minor adjustments. Horsepower range can be changed by substituting a different nozzle plate and valve parts.

For more information about the many advantages which these standardized turbines offer, call in your G-E sales-engineer or write for bulletin GEA-4955A, "A New Standard in Mechanical-drive Turbines." Section 252-56, General Electric Co., Schenectady 5, New York.

GENERAL ELECTRIC

For more than 25 years the Norwich Pharmacal Company has used U. S. P. Glycerine in the Zemacol formulation. This year 'round seller helps to relieve the itching and burning of a wide variety of skin irritations — from eczema-like rashes to poison ivy. Promoted as the "invisible bandage", Zemacol has long been one of Norwich's "top ten" products.

FULLY ACCEPTED . . . FULLY AVAILABLE IN ALL GRADES!

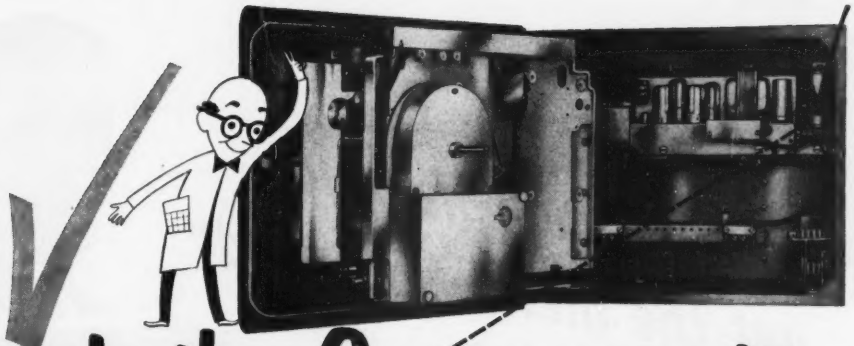
U. S. P. Glycerine demonstrates its versatility once again in dermatological preparations . . . where it often performs a *triple* function as humectant, emollient and solvent.

The low evaporation loss and unusual viscosity of Glycerine solutions help retain medication on irritated surfaces longer. Glycerine is colorless. Its solvent properties often make possible clear, uniform solutions of otherwise poorly miscible components.

That's why manufacturers in the pharmaceutical field look to Glycerine's unique range of properties. Further, users of any volume can count on a firm source of supply. Glycerine has become a component of *one out of four* prescriptions . . . an ingredient in hundreds of proprietary remedies. Why? We review the reasons in a booklet titled "Why Glycerine for Drugs and Cosmetics?" A copy is yours for the asking.

GLYCERINE PRODUCERS' ASSOCIATION

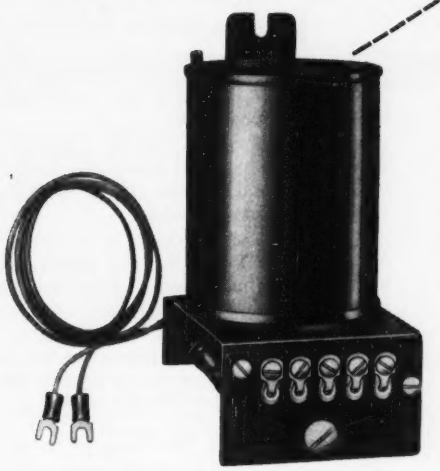
295 Madison Avenue, New York 17, N. Y.



Check the Components

of the BRISTOL DYNAMASTER

Continuous-Balancing Electronic Recorder



The Dynamaster is a superior recording and controlling instrument because every component part is superior.

Take the Syncroverter* Switch; pictured above.

This vibrator-type d-c to a-c converter incorporates so many unique improvements that many scientists, laboratories, and manufacturers are using it in their own devices.

Among its advantages are:

- ✓ Extremely long life
- ✓ Hermetically sealed against dust and corrosion.
- ✓ Dual reeds automatically cancel out thermal-induced emf
- ✓ Shock-proof and vibration-proof
- ✓ 1000-to-1 discrimination against external stray currents
- ✓ Has switching symmetry of better than ½ of 1 percent.

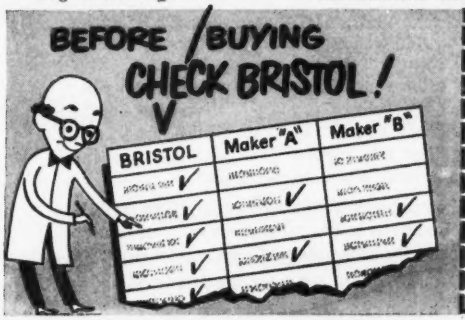
BRISTOL

The Syncroverter Switch is only ONE of the important features of the Dynamaster electronic recorder For full information, send for Catalog No. P1245.

The dependable Guidepost of Industry

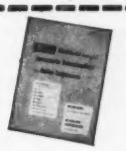
*Reg. U. S. Pat. Off.

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS



THE BRISTOL COMPANY
109 Bristol Road
Waterbury 20, Conn.

Please send catalog giving details of Dynamaster performance to:



NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

"How we may help you get the metal you need"

Maybe we can help you as we did this customer

"Monel sheet was required for a chemical unit. The customer assumed that Monel was not available though it was the metal that would do the job most satisfactorily.

"We, his warehouse, were able to advise him that a CMP rating could be secured for this particular application and the Monel could be had if he would take an extended mill delivery.

"Or, if he could give us a choice of alternate sizes and gauges, it might be available from our warehouse emergency stocks.

"He secured a rating, placed his order and in this case we were able to deliver the Monel sheet in time to meet his requirements."

• • •

And just what kind of help can these Warehouses give you? First, they are suppliers of metals . . . not only Inco Nickel Alloys but other metals as well. They know the availabilities and times needed for delivery.

These Warehouses maintain complete up-to-date information on Government orders and regulations – information that may save you time and trouble in getting the metals you need.

If you have a corrosion problem or require technical assistance on the fabrication or mechanical application of a metal or alloy, they will gladly help you. If they don't already have the necessary information they will get it from the engineering or research staffs at Inco.

WHAT *You* CAN DO:

1. Consult your Warehouse on availability of metals and alloys.

2. Order well in advance of your requirements. Deliveries take longer today.

3. Make certain that your orders carry the D.O. or C.M.P. ratings and in case of Dept. of Defense orders, include contract number.

4. Be sure also to give full and specific "end use" information as evidence of need for N.P.A. approval.

5. Indicate alternate choices on sizes and materials . . . where possible. By so doing a satisfactory alternate often may be obtained more promptly.

6. Depend upon your Warehouse for as much service as possible. Use its existing facilities to eliminate operations in your plant or ask for names of experienced fabricators who can help you.

7. Don't hesitate to ask technical questions about selection, uses and working of Nickel, Monel, Inconel and other critical metals. Often, suggestions can be offered which reduce shop spoilage . . . and *save metal.*

Very often your Metal Warehouse can help you overcome production difficulties with its on-the-spot knowledge of metals and availabilities. And frequently they can suggest substitute sizes, or in some cases name alternate materials.

All the companies listed here supply Inco Nickel Alloys. Just write to the one nearest you – or better still, pick up the phone and tell them your troubles.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street, New York 5, N. Y.

WAREHOUSE AND SERVICE CENTERS

INCO NICKEL ALLOYS

U. S., CANADA AND MEXICO

ATLANTA 3—J. M. Tull Metal & Supply Co.
285 Marietta Street, Tel.: Alpine 3871

BALTIMORE 5—Whitehead Metal Products Company, Inc.
4300 E. Monument Street, Tel.: Eastern 3200

BUFFALO 7—Whitehead Metal Products Company, Inc.
2128 Elmwood Avenue, Tel.: Bedford 3100

CAMBRIDGE 39, MASS.—Whitehead Metal Products Co., Inc.
281 Albany Street, Tel.: Trowbridge 6-4680

CHICAGO 23—Steel Sales Corporation
3348 South Pulaski Road, Tel.: Bishop 7-7700

CINCINNATI 29—Williams and Company, Inc.
3231 Fredonia Avenue, Tel.: Capitol 3000

CLEVELAND 14—Williams and Company, Inc.
3700 Perkins Avenue, Tel.: Utah 1-5000

COLUMBUS 8, OHIO—Williams and Company, Inc.
851 Williams Avenue, Tel.: Klondike 1623

DALLAS 9—Metal Goods Corporation
6211 Cedar Springs Road, Tel.: Elmhurst 3271

DENVER 2—Metal Goods Corporation
2425 Walnut Street, Tel.: Acoma 5891

DETROIT 10—Steel Sales Corporation
5151 Wesson Avenue, Tel.: Tyler 6-3000

EDMONTON, ALBERTA—Wilkinson Company, Ltd.
8411 103rd Street, Tel.: 35834

GRAND RAPIDS 2—Steel Sales Corporation
226 Federal Square Bldg., Tel.: Grand Rapids 9-3981

HARRISON, N. J.—Whitehead Metal Products Co., Inc.
1000 South 4th Street, Tel.: Humboldt 5-5900

HOUSTON 3—Metal Goods Corporation
711 Milby Street, Tel.: Central 8881

INDIANAPOLIS 2—Steel Sales Corporation
2059 North Illinois Street, Tel.: Talbot 1506

KANSAS CITY 8, MO.—Steel Sales Corporation
2201 Grand Avenue, Tel.: Victor 7270

LOS ANGELES 21—Pacific Metals Company, Ltd.
1400 South Alameda Street, Tel.: Prospect 0171

MEXICO, MEXICO, D. F.—La Paloma Co. De Metales, S.A.
Mesones No. 23, Apartado No. 7804

MILWAUKEE 9—Steel Sales Corporation
2400 West Cornell Street, Tel.: Hilltop 2-2020

MINNEAPOLIS 13—Steel Sales Corporation
401 Harding Street, N.E., Tel.: Sterling 4838

MONTREAL 1, QUE.—Robert W. Bartram, Limited
455 Craig Street West, Tel.: University 6-3711

NEW HAVEN 13—Whitehead Metal Products Co., Inc.
265 Church Street, Tel.: New Haven 8-0275

NEW ORLEANS 12—Metal Goods Corporation
432 Julia Street, Tel.: Canal 7373

NEW YORK 14—Whitehead Metal Products Co., Inc.
303 West 10th Street, Tel.: Watkins 4-1500

PHILADELPHIA 40—Whitehead Metal Products Co., Inc.
1965 Hunting Park Avenue, Tel.: Baldwin 9-2323

PITTSBURGH 33—Williams and Company, Inc.
901 Pennsylvania Avenue, Tel.: Cedar 1-8600

PORTLAND 12, ORE.—Eagle Metals Company
2336 North Randolph Avenue, Tel.: Tuxedo 5201

ST. LOUIS 10—Steel Sales Corporation
4565 McRee Avenue, Tel.: Grand 5255

SALT LAKE CITY 4—Pacific Metals Company, Ltd.
1186 South Main Street, Tel.: Salt Lake City 8-3421

SAN DIEGO 1—Pacific Metals Company, Ltd.
1533 India Street, Tel.: Franklin 9-5826

SAN FRANCISCO 10—Pacific Metals Company, Ltd.
3100 Nineteenth Street, Tel.: Mission 7-1104

SEATTLE 4—Eagle Metals Company
4755 First Avenue South, Tel.: Lander 9974

SPOKANE 8—Eagle Metals Company
East 320 Trent Avenue, Tel.: Madison 2419

SYRACUSE 4—Whitehead Metal Products Company, Inc.
207 W. Taylor Street, Tel.: Syracuse 3-0158

TOLEDO 2—Williams and Company, Inc.
650 East Woodruff Avenue, Tel.: Adams 8101

TORONTO 5, ONT.—Alloy Metal Sales, Limited
881 Bay Street, Tel.: Princess 2531

TULSA 3—Metal Goods Corporation
302 North Boston Street, Tel.: Tulsa 4-1175

VANCOUVER, B. C.—Wilkinson Company, Ltd.
190 West Second Avenue, Tel.: Fairmount 6101

WHAT *We, Your Warehouse,* CAN DO:

1. Advise on N.P.A. requirements, Government regulations.

2. Help metal users solve priority problems and advise on delivery schedules.

3. Help all users of Monel, Nickel, Inconel and other special alloys by giving practical advice on welding, machining, heat treating and other processing methods.

4. Advise on special sizes and shapes in stock which are maintained complete as possible under critical conditions. By suggesting alternate sizes or materials, production can often be kept moving.

5. Help overloaded plant facilities with special services . . . such as cutting, shearing or sawing to size.

6. Mill orders. A close working knowledge of mill conditions enables us to handle mill orders with maximum efficiency. We . . . where possible . . . offer part shipment from warehouse stock.

EMBLEM OF SERVICE

NICKEL (INCO) ALLOYS

MONEL® • "R"® MONEL • "K"® MONEL • "KR"® MONEL • "S"® MONEL
NICKEL • LOW CARBON NICKEL • DURANICKEL® • INCONEL®
INCONEL "X"® • INCOLOY® • NIMONICS

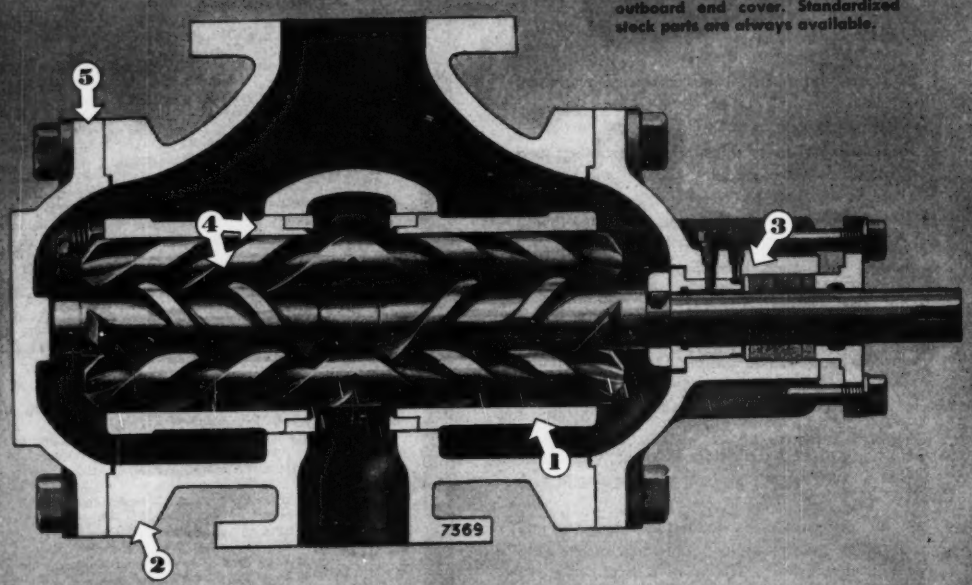
DE LAVAL IMO PUMPS *are versatile*

Look at these design features

CAPACITIES TO 1,000 GPM

PRESSURES TO 1,500 PSI

1. **MEEHANITE ROTOR HOUSINGS (LINERS)**—De Laval is specially licensed by Meehanite to produce this high quality alloy iron.
2. **MEEHANITE CASING**—Simple, one-piece, rugged construction—hydrostatically tested to 150% of maximum working pressures.
3. **STUFFING BOX**—Extra deep, subject only to suction pressure. A needle valve controlled seal is provided for pumps operating on suction lift.
4. **ROTORS AND HOUSINGS** can be replaced without reboring the case or using oversize rotors.
5. **EASY MAINTENANCE**—To replace rotors and housings, simply take off outboard end cover. Standardized stock parts are always available.



"moving men" for viscous fluids

Only 3 Moving Parts

The action of the De Laval-IMO pump is extremely simple. This unique pump has only three moving parts — a power rotor and a pair of sealing or idler rotors. There are no pilot gears, no sliding vanes, no reciprocating pistons . . . nothing to get out of order or need adjustment. Smoothly intermeshing IMO rotors propel the fluid axially without churning, pocketing or pulsation. There's no noise, vibration or hydraulic whine, even at high speeds. De Laval-IMO pumps are compact . . . can be directly connected to electric motors, turbines or other high speed drivers without reduction gearings, belts or chains.

Keeping viscous fluids "on the move" is a job De Laval-IMO rotary pumps do well throughout the process industries. Designed with the unique IMO principle, these quiet dependable pumps have proved their versatility in scores of applications. For example:

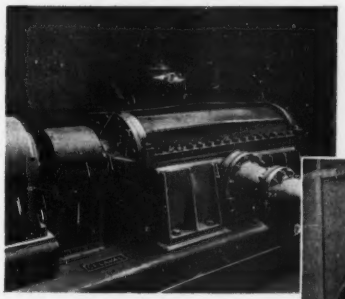
A bag manufacturer uses IMO pumps to remove paste from barrels and transfer it to the point of use on the machine. Each pump delivers approximately 2.5 gpm against 10 psi discharge pressure.

A sugar company specifies these rotary positive displacement pumps for handling *molasses* with a viscosity ranging from 17,000 to 25,000 SSU. Large IMOs deliver 350 gpm against a discharge pressure of 60 psi when operating at 280 rpm.

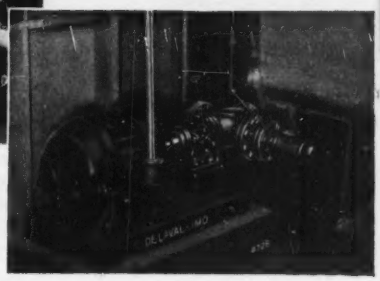
A synthetic fibre plant handles *"slurry"* running as high as 1,000,000 SSU with De Laval-IMO pumps. They reach capacities of 6-16 gpm at pressures as high as 450 psi at speeds of 150-450 rpm.

Several rayon mills have standardized on De Laval-IMO pumps for handling *viscose.* Models are available for capacities to 200 gpm against discharge pressures to approximately 160 psi.

These versatile pumps are also being used to handle *varnish, liquid latex, glue, chilled shortening, linseed oil, resin, soya oil, corn syrup* and many other viscous fluids. Models can be furnished for almost any fluid handling problem. Write for your copy of Bulletin LG describing the wide range line of De Laval-IMO pumps.



A 700 gpm transfer pump handling 8,500 SSU oil at 70 psi in a large mid-west refinery.



A De Laval-IMO pump drawing chilled shortening from picker box of chilling rolls and delivering under 500 pounds per square inch to packaging stand.

DE LAVAL *IMO Pumps*

DE LAVAL STEAM TURBINE COMPANY
Trenton 2, New Jersey

DL 150

BRIDGEPORT BRASS COMPANY
CONDENSER AND HEAT EXCHANGER TUBE EDITION
COPPER ALLOY BULLETIN
"Bridgeport" MILLS IN BRIDGEPORT, CONN. AND INDIANAPOLIS, IND.—IN CANADA: NORANDA COPPER AND BRASS LIMITED, MONTREAL

Safety and Efficiency Through Corrosion Inspection, Maintenance

Corrosion must be dealt with realistically because of its effect on safety, production and efficiency. This explains the vital importance of corrosion engineering in the petroleum refining industry.

A serious corrosion offender is water circulated by the millions of gallons for cooling purposes. Contamination may increase or decrease the corrosiveness of the water depending on temperature and other conditions. In most cases, the proper copper-base alloys can be successfully used to advantage. With suitable metals and good operating practice, corrosion can be kept within bounds.

Steel Clad With Brass

Raw liquid gasoline and vapors in crude fractionation and in thermal and catalytic cracking are sometimes very corrosive to steel, especially where the temperature is such that the water content is in the liquid phase.

Experimentation by Sun Oil Company showed that various high-zinc brasses—yellow brass, Muntz metal, naval and Admiralty—are much more resistant than steel to corrosion by sulfur compounds such as hydrogen sulfide, mercaptans, etc. Realizing that brass alone would not provide the maximum safety in case of fire, they lined with brass the pipes, fittings and the steel vessel nozzles in the wet gas, gasoline and water separators of such units. Joints were made by brazing or welding and machined smooth to minimize impingement type corrosion due to turbulence.

Steel was not allowed to come into contact with the raw gasoline containing small amounts of water in order to avoid galvanic attack. It was also necessary to have steel backing up the brass in cases where ammonia was present due to the possibility of season cracking. Some of these brass-lined installations have already been in service for ten years.

In addition, the use of bimetal tubes and non-ferrous linings simplify shut down inspection because it is known from experience that the corrosion rates are low and therefore it is not necessary to open such equipment every shut down.

Galvanic Corrosion Dangerous

No piece of equipment or part is too small to be overlooked from a safety standpoint. Even the failure of a small plug in a pump case opening can cause a serious fire. For example, steel or iron plugs in a brass or bronze or monel metal pump carrying a corrosive liquid may cause the ferrous plug to fail rapidly from galvanic corrosion. On the other hand, a brass plug in a ferrous pump is much less apt to give trouble. This illustrates the fact that the proper material must be used in the proper place.

In Sun Oil Company's square condensers, the steel baffle plates, which are attached to the doors, were originally designed to be separated from the brass tube sheets by means of fiber gaskets. In a short time the ends of the baffles were seriously corroded permitting the water to by-pass some of the tubes. By cutting back the front end of the baffles and welding a section of brass for direct contact with the tube sheet, galvanic attack was stopped.

Temperature Control Important

Sun Oil Company, in addition to river water, generally uses circulating water which is cooled and reclaimed. However, during hot weather, increased water temperatures cause appreciable rise in tube-wall temperatures and has a pronounced effect on corrosion rates.

Condensers and heat exchangers, containing Admiralty and Cupro Nickel tubes are given a thorough cleaning at the beginning of the warm season for more efficient operation. The product side which builds up an insulating coating on the outside of the tubes is thoroughly cleaned with a 10 per cent solution of trisodium-phosphate heated to boiling by live steam. During this cleaning operation the inside of the tube, or water side, dries out and the deposit of silt and slime becomes a dry powder which flakes off easily and can be blown out by compressed air.

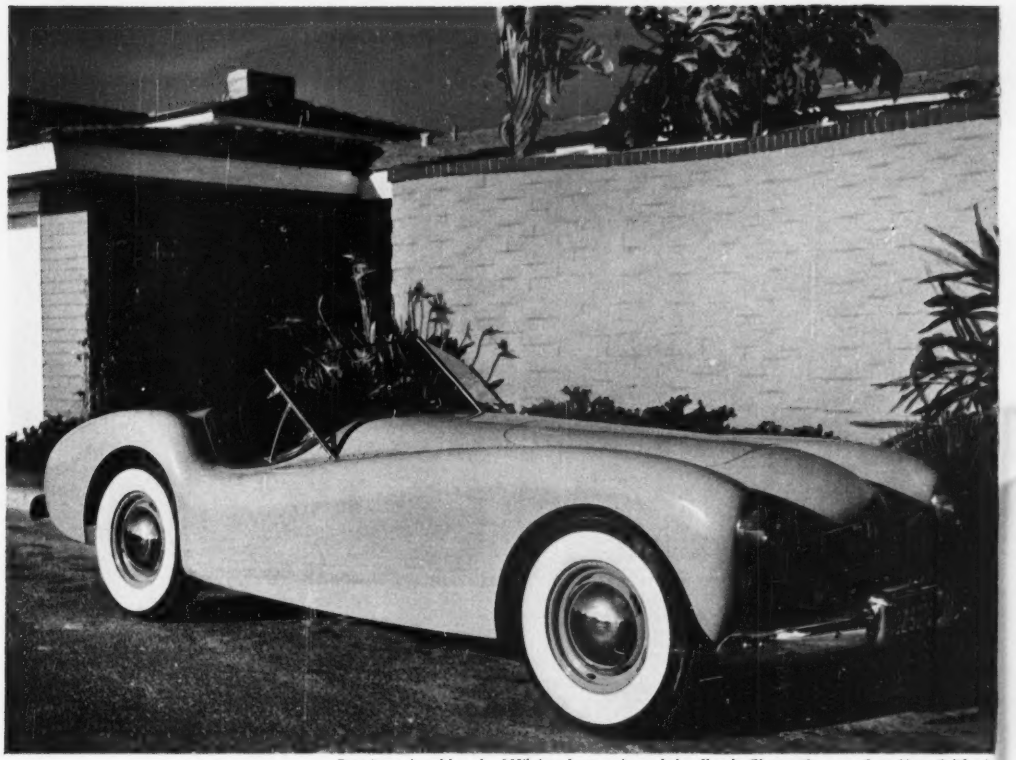
Preventive Maintenance

Sun Oil Company believes in preventive maintenance. Corrosion engineers are trained to take charge of certain units for the purpose of keeping an accurate record on the life of the tubing, pipelines and equipment, and to observe any deviation from established safe working conditions. They look for such troublemakers as thinning by corrosion, erosion or oxidation, fouling, breakages, bulging and pitting.

All equipment is inspected and gauged after a definite period of operation to make sure that the metal thickness conforms to their established factors of safety. Continuous records on the temperature changes on the product side and the cooling water indicate when the efficiency drop makes it necessary to shut down for cleaning the tubes. This practice of keeping temperatures as low as possible has a beneficial effect in keeping corrosion attack at a minimum.

Bridgeport's corrosion laboratory service is available to help operators of condensers and heat exchangers select the copper-base alloys which will serve best. (8592)

"Advertisement"



Experimental model made of Vibrin polyester resins and glass fibers by Glasspar Company, Costa Mesa, California

What would happen if somebody made...

an auto body of plastic?

Plenty—and all of it good! Look what happened when they made an all-plastic body of Naugatuck Vibrin polyester resin and glass fiber laminates.

No more wrinkled fenders! You just can't dent this car! After an impact that would crumple any ordinary fender or door, this amazing material springs right back to its original shape! It's unharmed except by the heaviest of impacts.*

No more rusting! Rain, snow, salt sea air, even the worst of weather won't harm this body.

Easy to make—easy to repair! Custom-built Vibrin car bodies are formed with a few large moldings—without pressure or heat—at a fraction of former toolage costs! And they are quickly and simply repaired in case of damage.

In fact, this Vibrin body is so light (no more than 200 lbs.) and simple in construction, it may be easily removed for major repairs to motor or chassis. Its lighter weight can mean reduced gas consumption and increased tire life, too!

Manufacturers, what do you want to make? Easy to see there's a worldful of profitable possibilities in Naugatuck Chemical's new Vibrin polyester resin. From figurines to limousines, it's constantly turning up new and better ways to new and better products. Find out what this unusual, news-making plastic can do for you. Send us the coupon below.

***Deliberately driven into a tree twice at 15 mph, a test model suffered only a 14-inch crack at the point of impact! The crack was repaired within an hour!**

Naugatuck Chemical

Division of **UNITED STATES RUBBER COMPANY** • Naugatuck, Conn.

BRANCHES: Akron • Boston • Charlotte • Chicago • Los Angeles • Memphis • New York • Philadelphia **IN CANADA:** Naugatuck Chemicals, Elmira, Ontario

MARVINOL® vinyl resins • KRALASTIC® styrene copolymers • VIBRIN® polyester resins • Rubber Chemicals • Aromatics • Synthetic Rubber • Agricultural Chemicals • Reclaimed Rubber • Latices

Naugatuck Chemical Plastics Division, 206 Elm Street
Naugatuck, Connecticut

Without charge, send technical data for these end uses:

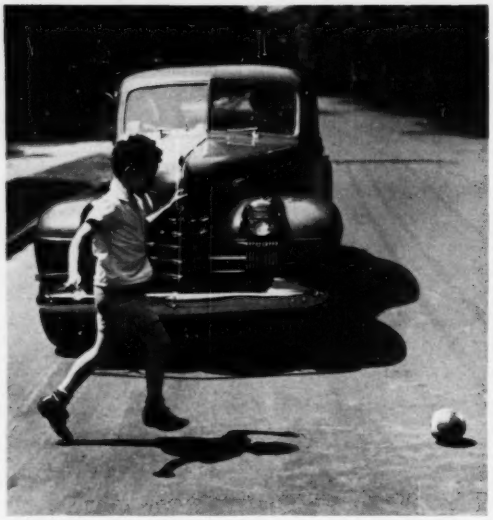
NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE ____ STATE _____

How would YOU solve these two problems?



POSITIVE BRAKE-ACTION, so essential to public safety, is aided by use of the Permafuse Corporation's special brake-bonding oven. Installed in progressive service stations, the Permafuse oven fuses the adhesive-coated brake lining to the brake shoe evenly and permanently. A low-cost, rugged THERMOSWITCH® unit keeps oven temperature constant for proper bonding and keeps service calls to a minimum.

PREVENTION OF SPOILAGE in refrigeration applications is a matter of constant, exact temperature control. In the Jewett Hospital Blood Bank, for example, temperature is maintained at 37°F within plus or minus 2 degrees. Two Fenwal THERMOSWITCH thermostats serve as an alarm device, warning instantly against freezing or refrigeration failure if temperature goes below 32° F or above 48° F.

A FENWAL THERMOSWITCH CONTROL may solve your problem, too. Its external, single-metal shell expands or contracts *instantly* with temperature changes, making or breaking enclosed electrical contacts. Compact, highly resistant to shock and vibration, Fenwal THERMOSWITCH units have solved hundreds of problems where heat is a factor.

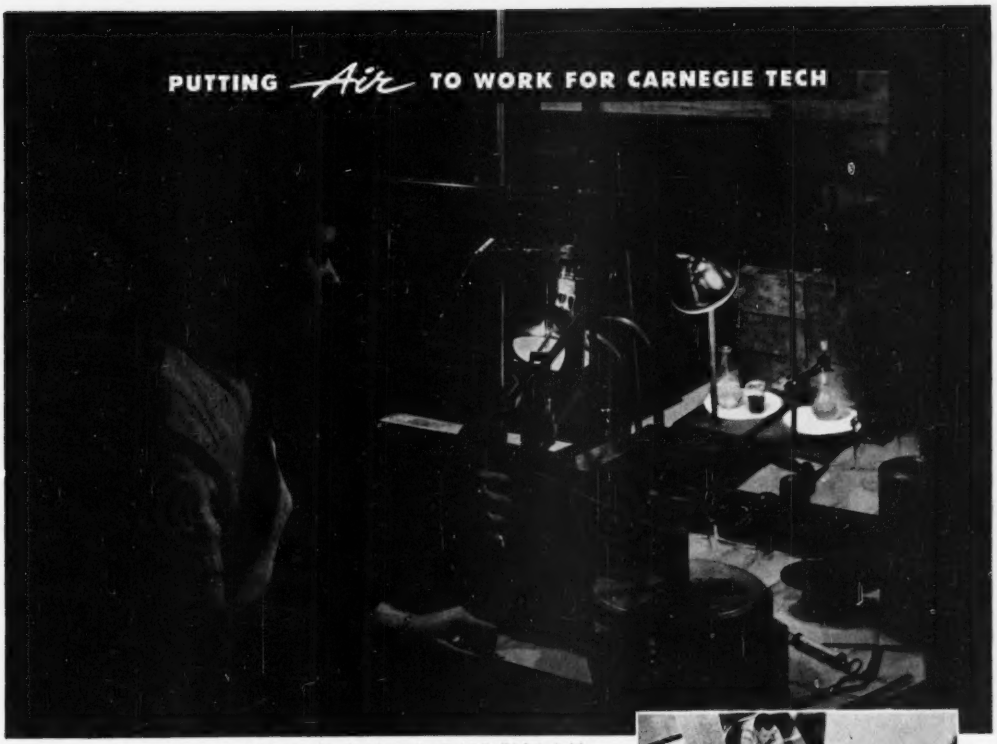
SEND FOR THIS CATALOG for complete explanation of the unique THERMOSWITCH unit. Also ask for more detailed, illustrated discussions of the problems above. Fenwal engineers will be glad to help you solve your temperature control problems involving heat, humidity, radiant heat, pressure and other variables. Write Fenwal, Incorporated, 168 Pleasant Street, Ashland, Mass.

Fenwal

THERMOSWITCH®

Electric Temperature Control and Detection Devices

SENSITIVE . . . *but only to heat*



Lead bricks and special fume exhaust equipment protect "Hot" lab technician from two hazards—direct radiation and contaminated air.

HOW TO TAME "HOT" AIR

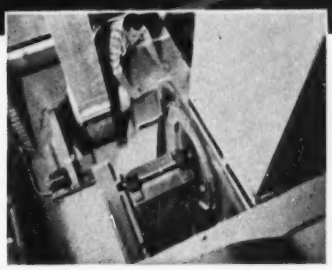
AROUND RADIOACTIVE MATERIALS

In the hand of the technologist is an awesome new tool—the radioactive isotope. But it is two-edged. With all its promise, it poses grave new problems in safety—including contamination of air by radioactive fumes, vapors and airborne particles.

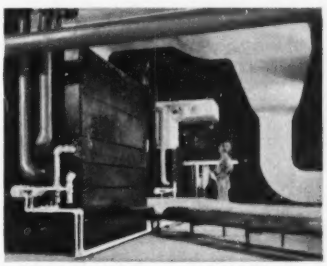
Control of dangerous air can be relatively simple, like the special laboratory hood and Westinghouse fume exhaust equipment shown here in the Chemistry Department at Carnegie Tech. In varying degree, the problem can be more complicated—like cooling the atomic pile at the Brookhaven National Laboratories. But for each case there's an effective answer.

For, long before the first reactor pile was built, Westinghouse engineers were studying and employing radioactive materials. In the Sturtevant Division this has culminated in a fund of knowledge and tested equipment for safe control of "hot" atmospheres.

If you are using radioactive materials, or for that matter if you have *any* air handling problem where it pays to be sure, check into Westinghouse equipment for air handling, air cleaning and air conditioning. Call the Westinghouse-Sturtevant office nearest you, or write to Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Mass.



Silentvane® Fans move the large volumes of air which are drawn from exhaust hoods quietly and positively.



Westinghouse air conditioning and air handling units help keep laboratory temperature and humidity constant.

YOU CAN BE SURE...IF IT'S Westinghouse

J-80250

TUNE IN ON HISTORY! Only Westinghouse brings you complete coverage of four-month political campaign over CBS television and radio.

AIR HANDLING

SPECIAL STAINLESS STEEL INNER WIRE BRAID IS SECURELY LOCKED TO INSIDE WALL OF TUBE. You get this added safety protection and assurance of longer hose life only with CONCORD #20 STEAM HOSE . . . another of BWH's significant developments in the field of mechanical rubber products!

Resists Tube Swelling

Withstands Tough Usage

Concord #20
STEAM HOSE

Here's the steam hose with built-in long life . . . in the form of a special stainless steel inner wire braid.

This inner lining is there to fight tube swelling under continuous high pressure . . . a condition that kills ordinary steam hose — and usually kills it *fast.*

Found only in CONCORD #20 STEAM HOSE, this protection helps assure retention of original inside hose diameter . . . acts against swelling and constriction of tube . . . promotes full flow of steam and easy recoupling in the field when necessary.

CONCORD #20 includes other construction features: two or three braids (depending on size) of alternate high tensile steel wire and rubber layers firmly bonded over outside of tube for maximum burst protection and safety; an asbestos braid for positive cover adhesion and cover insulation; a rugged, abrasion-resistant cover that withstands the toughest abuse.

Put CONCORD #20 to work for you now . . . get in touch with your nearby BWH distributor today.

BWH
DEPENDABLE RUGGEDNESS

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Warehouse Stock: 111 N. Canal St., Chicago, Illinois **Distributors in all Principal Cities**

PLANT: CAMBRIDGE, MASS. • P. O. BOX 1071, BOSTON 3, MASS., U. S. A.

What tube steel gives you the best life/cost ratio? Ask the experts!

This month's report is on: **2% CR.-MO.**

Has intermediate corrosion resistance in combination with good creep strength and fair resistance to oxidation. For use at temperatures up to 1200° F. in cracking coils, reforming units, heat exchangers, vapor line and hot oil piping, and return-bend forgings for oil heaters.

23 TIMKEN® STEELS FOR HIGH TEMPERATURE SERVICE

Carbon	Sicromo 2	Sicromo 5S	16-13-3*
Carbon-Mo.	Sicromo 2½	Sicromo 5MS	25-20*
DM-2	2¼% Cr.-1% Mo.	Sicromo 7	25-12*
Silmo	Sicromo 3	Sicromo 9M	35-15*
DM	4-6% Cr.-Mo.	18-8 Stainless	16-25-6*
2% Cr.-Mo.	4-6% Cr.-Mo.-Ti.	18-8 Cb	

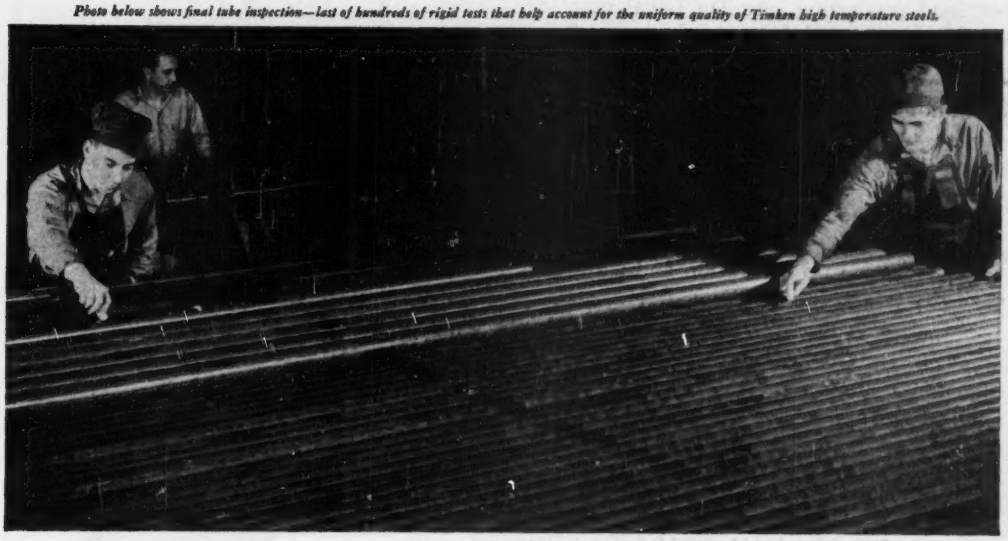
*Not available as seamless tubing at the present time.

MAYBE you can find several high temperature tube steels that will solve your particular set of heat, pressure, corrosion and oxidation problems. But there's only *one* steel that will give you maximum tube life per dollar—the best life/cost ratio.

To find that one steel, go to the metallurgists of The Timken Roller Bearing Company. They're recognized authorities on high temperature steels. Backed by 20 years' experience and research and with 23 different analyses at their disposal, they'll help you choose the one best steel for your application. And you'll be assured of uniform quality in every tube because of the Timken Company's rigid quality control from melt shop through final inspection.

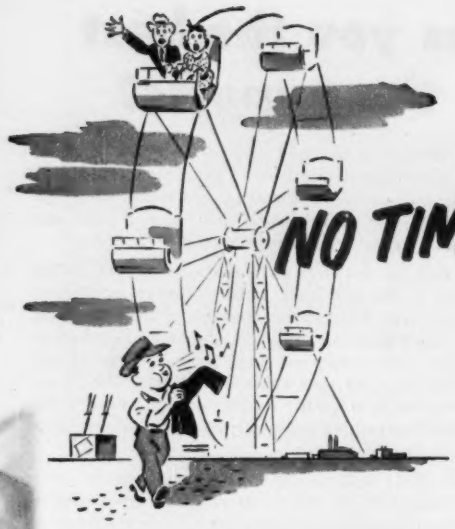
Our "RSQ"—Research, Supply, Quality—can solve your tube problems. *Ask the experts!* The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

Photo below shows final tube inspection—last of hundreds of rigid tests that help account for the uniform quality of Timken high temperature steels.



YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING



NO TIME FOR INTERRUPTION

To remove unnecessary "slow spots" in chemical or food processing, use De Laval machines. They enable centrifugal force to do in seconds—***continuously***—jobs of separation and clarification that gravity settling or inefficient filters might take minutes or even hours to accomplish.

Sometimes De Laval machines will break emulsions that are apparently too tight to be broken at all by inferior separating methods. Almost invariably, these continuous Separators and Clarifiers do two things especially well:

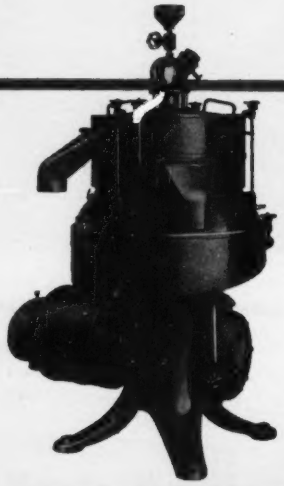
(1) Speed up separation and clarification

(2) Produce a clearer, better product

Specific gravity, viscosity of the liquids, the quantity and quality of solids present in one or both liquids, all affect the choice of centrifuge for a given application. Each De Laval centrifugal machine has been designed to do a particular kind of work,—the De Laval representative in your territory will help you select the right machine for ***your*** need.

WHY DE LAVAL?

De Laval has over 70 years' experience in solving problems of separation and clarification. Your problem may be quite similar to one that has already been solved by De Laval centrifugals. It will pay you to ask.

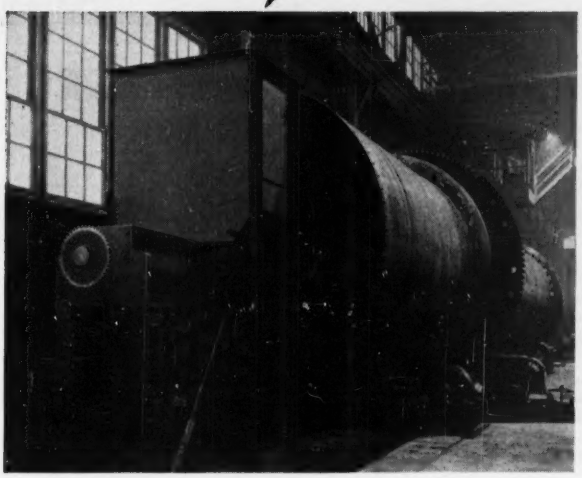


THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL

for CONTINUOUS Separation with Centrifugals

New Dryer Requires the ACCURACY & UNIFORMITY of *Carpenter* Stainless Tubing

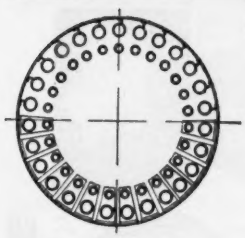


Modern process equipment like this rotary steam-tube dryer has to *stay on the job.* You can't afford to interrupt a process for hours or days to replace tubes.

That's why—after considering several sources—this manufacturer's orders call for Carpenter Stainless Tubing. He knows that the quality standards we set at the mill will safeguard the quality reputation of his equipment.

Analysis, Tolerance and Finish are guaranteed to be "as ordered" on every shipment of Carpenter Stainless Tubing.

THE CARPENTER STEEL COMPANY
Alloy Tube Division, Union, N. J.
Export Dept.: The Carpenter Steel Company, Port Washington, N. Y.—"CARSTEELCO"



Cross-section view shows how Carpenter Stainless Tubing is arranged in concentric circles. Tubes in the inner circle are smaller diameter than outer tubes, to provide clearance and prevent lumps of material from wedging between tubes.

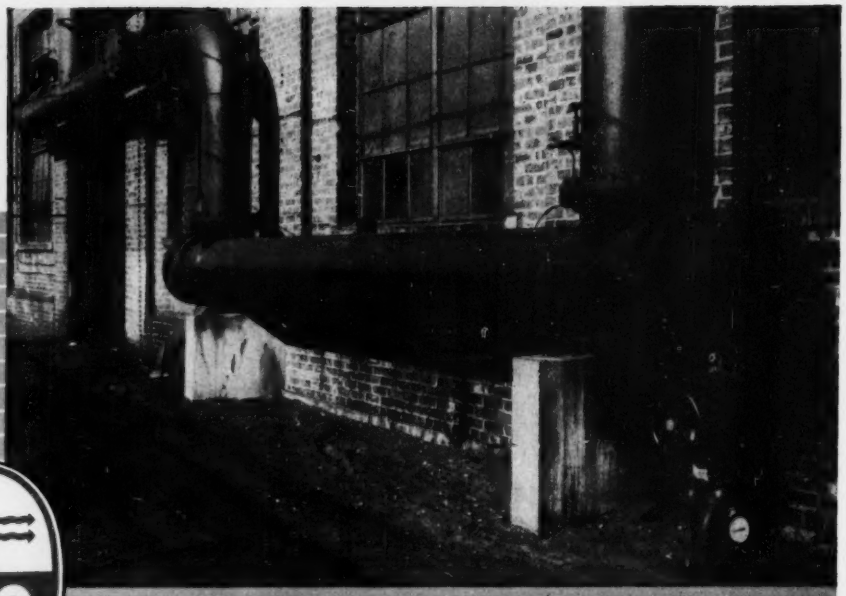
Carpenter

STAINLESS TUBING

—guaranteed on every shipment

THE U.S. NEEDS YOUR STEEL SCRAP NOW

Installation of B & G Gas Cooler



Hydro-Flo HEAT EXCHANGERS

invite your critical appraisal of design and workmanship

Whether you require equipment of standard design or specially engineered units, B & G *Hydro-Flo* Heat Exchangers will stand up under any measurement of value you can apply. They are the sum of both practical field experience and continuous laboratory research and development.

The sound design of B & G *Hydro-Flo* Heat Exchangers is translated by modern manufacturing methods into units of proved efficiency . . . built to do the job well over a long operating life. The line is comprehensive—covering the numerous applications of heat exchangers in modern industrial plants.

The B & G engineering staff is always available for consultation on your heat transfer problems.

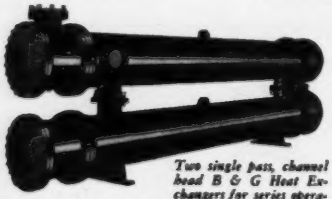
B&G Hydro-Flo shell-and-tube heat exchangers are available in the following types:

Straight and "U" Bend Tube Heat Exchangers . . . Fuel Oil Preheaters . . . Tank Suction Heaters . . . Aftercoolers . . . Gas coolers . . . Water Heaters . . . Refrigeration Evaporators and Condensers . . . Quench Oil Coolers.

BELL & GOSSETT COMPANY

Dept. CO-14, Morton Grove, Ill.

Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto, Canada



Two single pass, channel head B & G Heat Exchangers for series operation.

High pressure B&G Heater with fixed tube sheets and expansion joint design.

B & G CENTRIFUGAL PUMPS
A complete line for industrial application and refrigeration or air conditioning installations. Send for catalogs.

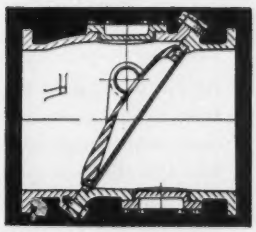
Here's the One "TILT" that Pays Off On the Level!...

the TILTING DISC in CHAPMAN'S CHECK VALVE

Yes, this is on the level . . . Chapman's Tilting Disc design offers you savings in head loss 65% to 85% over regular swing-type check valves.

For this Tilting Disc rides the flow . . . cushions itself to a quick, *quiet* closure right at the instant when there's no velocity in the line. There's no slamming, under usual pipeline arrangements. So there's no jarring of the line, no opening of the joints, no wear of moving parts worth mentioning. And seating is *drop-tight.*

Certified engineering test-results are charted in Catalog No. 30. Take a look at these tests . . . and then figure what Chapman Tilting Disc Check Valves can save for *you.* Send for your copy now.



Cross-section of the Chapman Tilting-Disc Check Valve. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

THE CHAPMAN VALVE MFG. CO., INDIAN ORCHARD, MASSACHUSETTS

Light Weight—Strongly made of stainless steel to protect your chemical products while reducing transportation costs.

One-Man Handling—These compact, lightweight 15½-gallon barrels are easily and safely handled by one man.

Hackney MILWAUKEE

stainless steel chemical containers reduce handling costs

Safe Pouring—Handy, full curled foot rings are easy to grasp—eliminate hazardous spilling of dangerous acids.

Perfect Stacking—Bottom foot ring fits snugly and securely over top ring of first barrel to build a safe, compact stack.

Positive Identification—Easy-to-read lettering on bottom foot ring quickly identifies owner—advertises owner's name and address. I.C.C. data embossed in top ring.

Here's the modern way to ship and store acids, solvents, extracts, fruit juices, oils and many other dangerous or perishable products. Use Hackney Stainless Steel Chemical Containers and save handling costs all along the line. You'll find one-man handling is practical—transportation costs are lower—storage requirements are reduced—breakage and spilling hazards are eliminated. Made in several types of stainless steel for specific product protection. Write today for full details.

Pressed Steel Tank Company

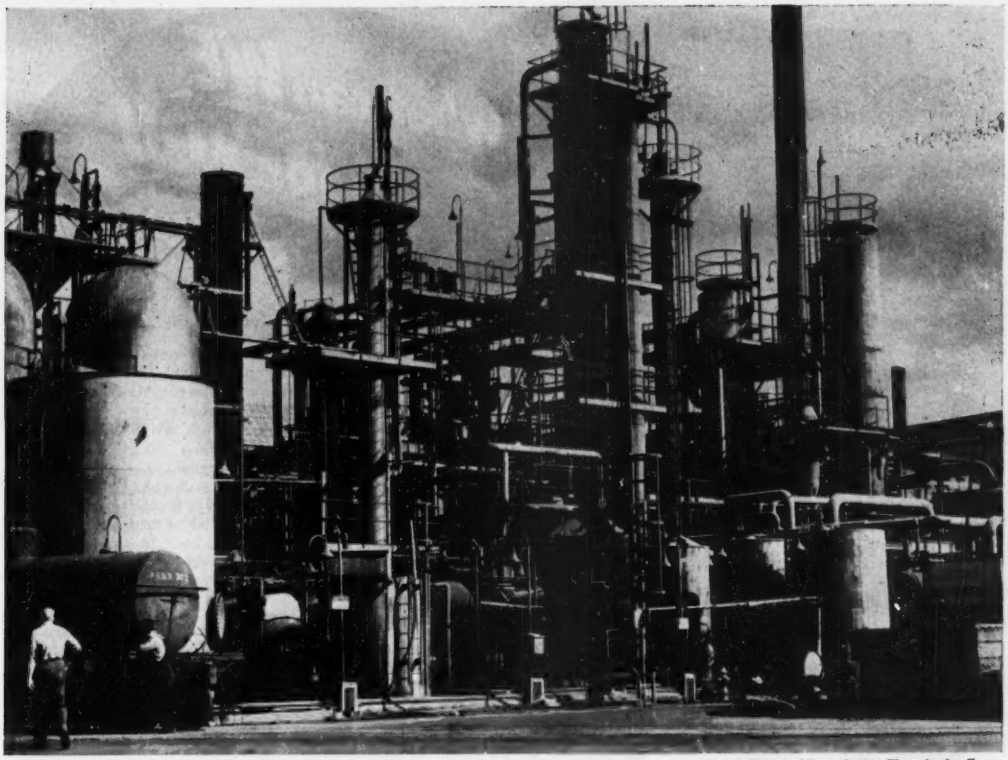
Hackney MILWAUKEE

Manufacturer of Hackney Products

1447 S. 66th St., Milwaukee 14 • 1325 Vanderbilt Concourse Bldg., New York 17 • 203 Henna Bldg., Cleveland 15
936 W. Peachtree St., N.W., Room 113, Atlanta 3 • 208 South La Salle Street, Room 792, Chicago 4 • 553 Roosevelt Bldg., Los Angeles 17

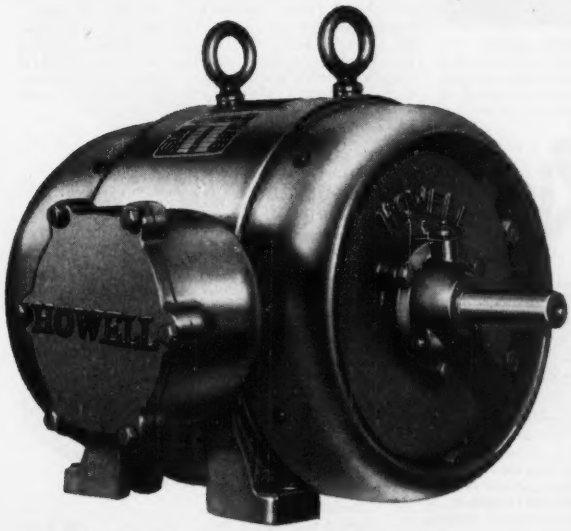
PRESSED STEEL TANK COMPANY 1900 1952 FIFTIETH ANNIVERSARY

CONTAINERS FOR GASES; LIQUIDS AND SOLIDS



Glycol Plant, Wyandotte Chemicals Corp.

Howell Motors help maintain volume chemical production



Howell Explosion-proof Motor for hazardous locations

The electric motors used in the preparation and handling of chemical products must meet two vital requirements — they must fit the job exactly, and must stand up under rigorous operating conditions.

Howell Motors are used throughout the chemical industry, because in the Howell line there is a motor to fit the requirements of every job. And Howell's careful attention to the details of design and manufacture assure uninterrupted production with minimum maintenance.

Howell Motors are *industrial* motors, built especially to handle *tough motor jobs!*

Take *your* electric motor problems to Howell — call the Howell representative in your city today.

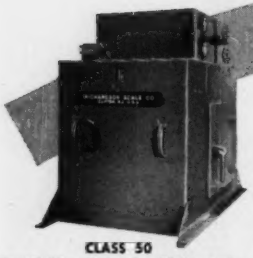
HOWELL Red Band MOTORS

HOWELL MOTORS

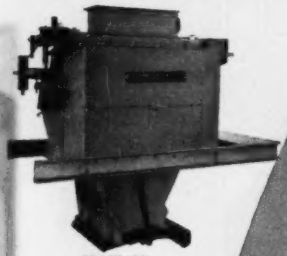
HOWELL ELECTRIC MOTORS CO., HOWELL, MICHIGAN

Precision-built industrial motors since 1915

what can WE do for YOU Mr. Processor?

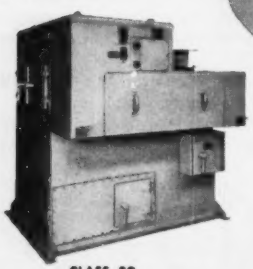


CLASS 50
Dust-tight, all-electric, high-speed, accuracy-indicating scale for weighing dry, ground, granular, dusty, non-free-flowing and some small lumpy materials. Bulletin 3649.



CLASS 38
Dust-tight, heavy-duty scale for dry, ground, dusty, non-free-flowing materials. Bulletin 8946.

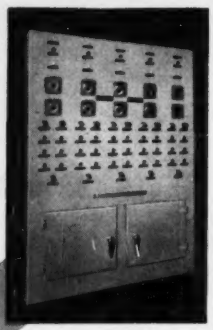
CLASS 40
Accommodates screw, belt, or vibrating feeder for handling wide range of materials. Dust-tight, solenoid- or motor-operated discharge, accuracy-indicating. Bulletin 1449.



CLASS 39
Self-contained, dust-tight, belt-feeding and weighing unit. Accuracy-indicating for process or intermittent batch weighing of lumpy, crushed, sluggish materials. Bulletin 1549.

Frankly, that's the reason we're running this ad—not to tell you about our products, but to ask you about your plant problems. Because if your business involves the handling of any materials or liquids by weight, we think you probably have an operation or two which just doesn't measure up in efficiency, economy, or speed. We'd like to know about it, because we think we can help.

You can call it pride, or conceit, or self-satisfaction, or self-confidence, but our engineers have never been stumped for long by a problem in materials-handling by weight—and in fifty years of working with the biggest names in American industry we've seen a lot of them! From aluminum sulphate, to zinc oxide, and back to almonds we've successfully installed Richardson units or systems to handle just about everything in the book, and built a lot of goodwill and a fair-size company in the process.



CONTROL PANEL
Richardson-designed panels such as this control whole automatic weighing systems composed of scales like those at the left.

Naturally, if a Richardson Scale can contribute to the smoother, faster, or more profitable operation of your plant, we'd like to sell you one. We think that our products and experience can help in solving your problem in processing, and if you'll outline it, we'll be glad to have one of our field engineers arrange to go over it with you.

Or, if you'd just like to know more about Richardson Scales for possible future reference, simply clip this ad to your signed letterhead and mail. Bulletins 0450, 0550, and 0351 will be sent you by return mail—no obligation.

The Richardson Scale Company, Clifton, N. J., will be glad to supply information on:

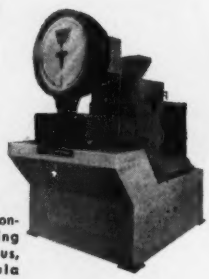
Feeder-Weigher Systems • Automatic Bulk Weighing Hopper Scales • Automatic Bagging Scales • Bag Sewing Conveyors Packers • Process Control Panels and Select-O-Weigh

Please write direct to our Clifton office, or to the nearest of our branch offices located in Atlanta, Boston, Detroit, Minneapolis, Cincinnati, Wichita, Montreal, Omaha, New York, Pittsburgh, San Francisco, Toronto, Buffalo, Chicago, Philadelphia, Houston, St. Louis.

Richardson

MATERIALS HANDLING BY WEIGHT SINCE 1902

CLASS 56
Self-checking, automatic feeder-weigher for large tonnage; practically continuous stream delivery. Beam system has approval of all weighing authorities. Bulletin 2140-2.



SELECT-O-WEIGH
On electronic weight control system providing remote, instantaneous, dial-control formula changing and ingredient selection for all proportioning applications. Bulletin 0351.

8369

Processing ACTH in Stokes Vacuum freeze-drying equipment at Armour Laboratories, Chicago, Illinois.

Modern Benefits

to the hog.....from the hog

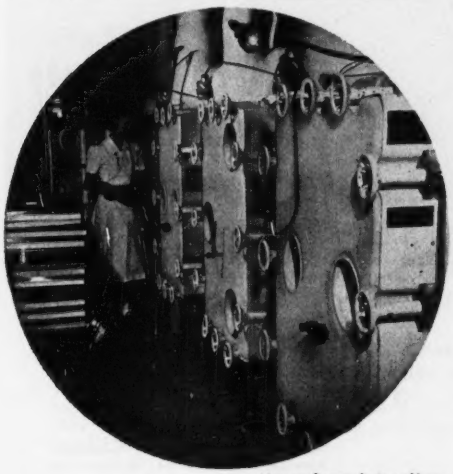
by Vacuum Processing

New serums made by vacuum freeze-drying give promise of wiping out the plague of hog cholera which for a century or more has cost the world incalculable millions of dollars.

New hormones made by vacuum freeze-drying from hog glands are effecting dramatic alleviation or cure of arthritis and many other diseases.

Vacuum freeze-drying – one of many modern techniques pioneered by Stokes and carried out commercially with Stokes equipment – captures life, defies oxidation, halts aging, preserves potency, for the benefit of mankind.

Stokes engineers invite consultation on modern vacuum techniques of chemical processing – drying, impregnating, metallizing – of pharmaceuticals, chemicals and many industrial products.

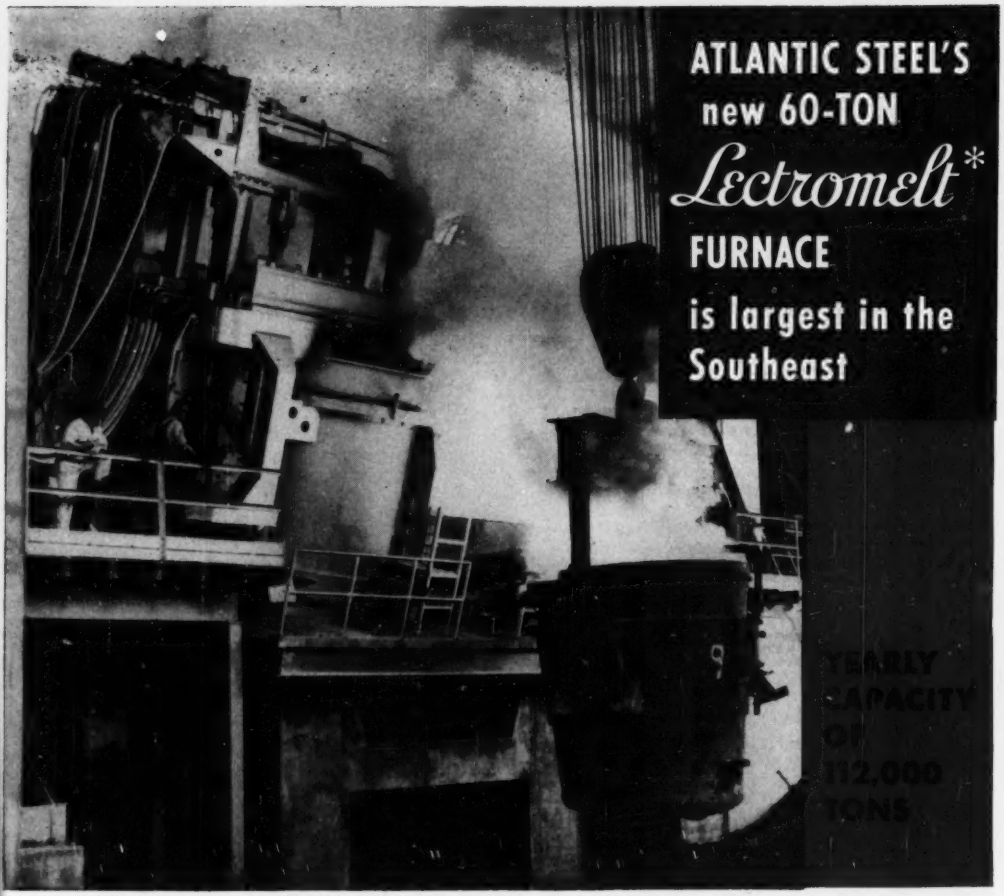


Vacuum freeze-drying of hog cholera serum at Pitman-Moore Laboratories, Zionsville, Indiana.

STOKES

STOKES MAKES
Plastics Molding Presses,
Industrial Tabletting
and Powder Metal Presses,
Pharmaceutical Equipment,
Vacuum Processing Equipment,
High Vacuum Pumps and Gages,
Special Machinery

F. J. STOKES MACHINE COMPANY, 5539 TABOR ROAD, PHILADELPHIA 20, PA.



W. E. Moore, inventor of the Moore Rapid Lectromelt* Furnace, was among the celebrities who witnessed the first official pouring of metal here at Atlantic Steel Company, Atlanta, Georgia. The furnace is this company's first electric furnace, and the largest of its kind in the Southeast.

The "JT" Lectromelt Furnace has an 18-foot shell diameter, is rated at 60 tons, but is capable of producing 75 tons of steel ingots per-heat. It has timesaving and laborsaving top-charging.

If you're interested in furnaces for melting, refining, smelting or reduction, write for Catalog No. 8, Pittsburgh Lectromelt Furnace Corporation, 303 32nd Street, Pittsburgh 30, Pennsylvania.

Manufactured in...CANADA: Lectromelt Furnaces of Canada, Ltd., Toronto 2... ENGLAND: Birlec, Ltd., Birmingham... AUSTRALIA: Birlec, Ltd., Sydney... FRANCE: Stein et Roubaix, Paris... BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege... SPAIN: General Electrica Espanola, Bilbao... ITALY: Forni Stein, Genoa.

*REG. T. M. U. S. PAT. OFF.

MOORE RAPID

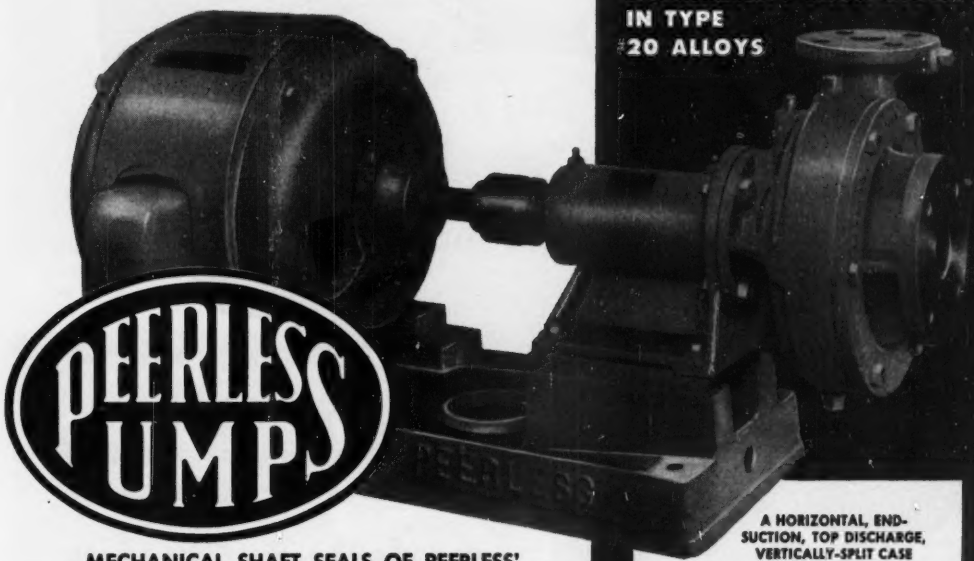
WHEN YOU MELT... *Lectromelt*

PEERLESS type CTB CHEMICAL TRANSFER PUMP...

For continuous or intermittent light duty in transferring process chemicals

Featuring:

MECHANICAL SEAL DEPENDABILITY
RUGGED CONSTRUCTION
QUALITY MATERIALS
QUICK MAINTENANCE
LOW INITIAL COST AND AVAILABILITY FROM STOCK IN TYPE #20 ALLOYS



A HORIZONTAL, END-SUCTION, TOP DISCHARGE, VERTICALLY-SPLIT CASE CENTRIFUGAL PUMP

CAPACITY RANGE:	10 to 250 gpm
HEAD RANGE:	10 to 140 feet
HP RANGE:	¼ to 10 hp
CASE PRESSURE:	100 lbs.
LIQUID TEMPERATURE:	Up to 250°F
MATERIALS OF CONSTRUCTION:	Frame—cast iron Liquid End—Type No. 20 Stainless steel alloy

MECHANICAL SHAFT SEALS OF PEERLESS' OWN DESIGN AND MANUFACTURE ELIMINATE STUFFING BOX TROUBLES AND SHAFT LEAKAGE

Since the Type CTB chemical transfer pump is designed with and for a mechanical shaft seal and the stuffing box is eliminated, the Type CTB pump has less shaft overhang, reduced bearing loads, less run-out at the seal. This design also effects a sizable reduction in both pump and seal costs. The seal is Peerless' own design and construction and is available from stock.

SEMI-OPEN IMPELLER WITH REPELLING VANES ON BACK SHROUD EASILY PUMPS SOLUTIONS CONTAINING SUSPENDED SOLIDS

The non-clogging characteristics of the open impeller design used in the Type CTB pump assures maximum abrasive and slurry handling abilities. The action of the repelling vanes not only minimizes recirculation losses but reduces pressure on the shaft seal, providing optimum seal performance.

You can buy and apply this ruggedly-built transfer pump with the confidence that you'll get low operational costs and long "in service" continuity.

WRITE FOR BULLETIN TODAY

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION
Factories: Los Angeles, California and Indianapolis, Indiana.
Offices: New York, Atlanta, Chicago, St. Louis, Phoenix, Fresno, Los Angeles; Dallas, Plainview and Lubbock, Texas; Tulsa, Albuquerque, N. M.
Distributors in Principal Cities; Consult your Telephone Directory.

PEERLESS PUMPS — fmc

PEERLESS PUMP DIVISION
Food Machinery and Chemical Corporation
301 West Avenue 26
Los Angeles 31, California

Please send us a copy of Peerless Type CTB Pump Bulletin No. B-1606.

NAME_____

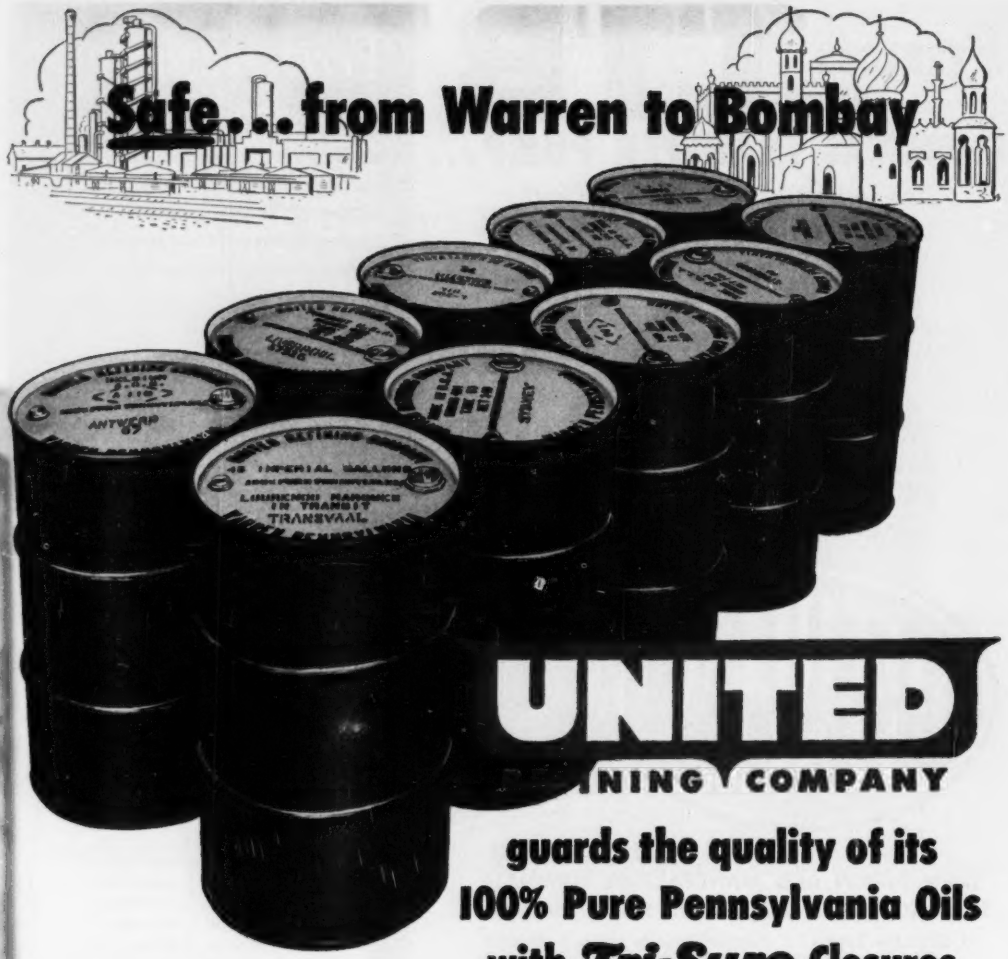
COMPANY_____

STREET_____

CITY_____ STATE_____

CHEM. ENG.

Safe . . . from Warren to Bombay



UNITED
NING COMPANY

guards the quality of its 100% Pure Pennsylvania Oils with *Tri-Sure* Closures

Tri-Sure
Reg. U. S. Pat. Off.
CLOSURES

*The "Tri-Sure" Tradelnark is a mark of reliability backed by 30 years serving industry. It tells your customers that genuine Tri-Sure Flanges (inserted with genuine Tri-Sure dies), Plugs and Seals have been used.

From United's refineries in Warren, Pa., drums of 100% Pure Pennsylvania Oil are shipped to Bombay . . . Sydney . . . Antwerp . . . Casablanca . . . Rio . . . and other ports in every continent.

Many of these drums must travel over 8,000 miles—exposed to the severest weather and climatic changes. Yet the quality oil that leaves Warren is *delivered*—safe from leakage, contamination and tampering—because United's drums are protected by Tri-Sure* Closures.

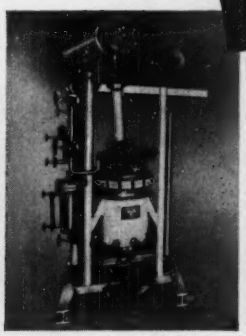
The United Refining Company, like other shippers that have built a reputation for quality, has proved that *protection* must be as efficient as *production*. Instead of taking chances with your drum shipments, take the sure way to safeguard your product and prestige: when you order drums always specify "Tri-Sure Closures".

AMERICAN FLANGE & MANUFACTURING CO. INC., 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.
Tri-Sure Products Limited, St. Catharines, Ontario, Canada

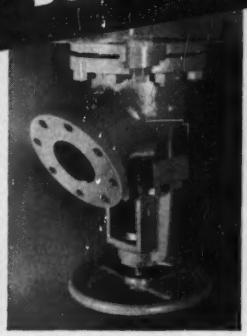
Standard or Special Large or Small...

BLAW-KNOX BUILDS THEM ALL!

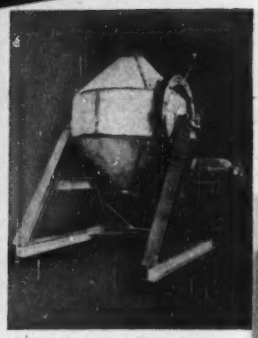
Special Vertical Autoclave for curing safety glass.



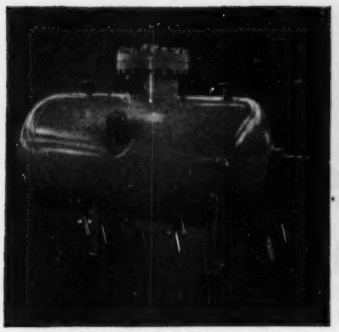
Electro-Vapor® Heated Resin Pilot Plant



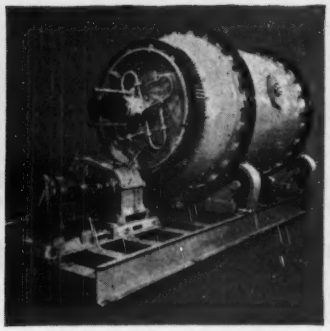
Flush Type Plug Valve



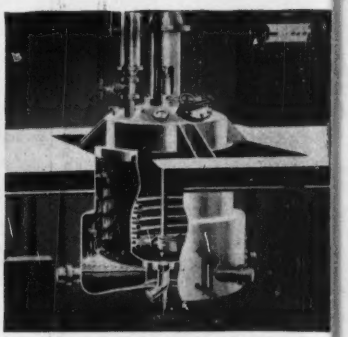
Stainless steel Granulation Blender



Horizontal Jacketed Autoclave with helical type agitation.



Jacketed Rotary Carbonator



Cut-away view of Electro-Vapor® heated Reaction Kettle.

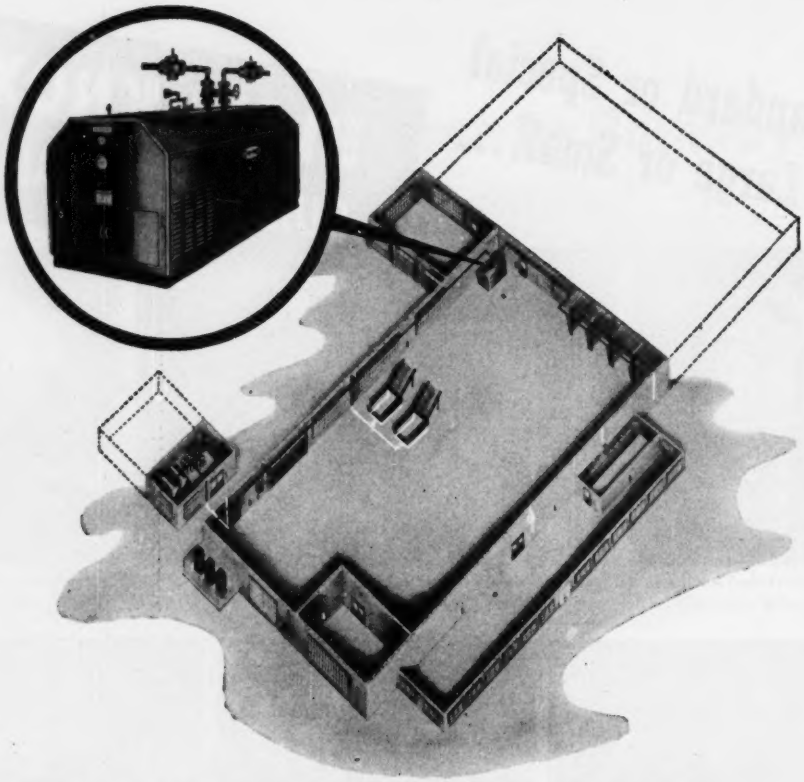
EQUIPMENT FOR:

Distillation • Cracking • Gas Cleaning • Solvent Extraction • Solvent Recovery • Heat Transfer • Gas Absorption • Polymerizing • Evaporation • Crystallization • High Pressure Processing • Impregnating and other processes

Do you need a ½-gallon laboratory autoclave? Or a commercial unit of several hundred gallons capacity? Blaw-Knox has the extensive manufacturing facilities and engineering experience to furnish processing equipment which will meet your requirements in every respect. In addition to standard units we also fabricate special equipment to specifications. For further information write for Bulletin 2383.

PROCESS EQUIPMENT DEPARTMENT
BLAW-KNOX DIVISION of Blaw-Knox Company
2090 Farmers Bank Bldg., Pittsburgh 22, Pa.
Other Offices in Principal Cities

BLAW-KNOX PROCESS EQUIPMENT



EXPANSIBLE FIRESAFETY

from a single LOW PRESSURE CARBON DIOXIDE storage tank

When expanding your plant, you can't afford to wait for additional fire protection...you need the proper amount at once. However today, material priority regulations slow you up considerably...these delays hold back vital production and resulting revenue. Install a C-O-TWO Low Pressure Carbon Dioxide Type Fire Extinguishing System in your plant now and new construction to come will be firesafe from the start.

With a C-O-TWO Low Pressure Carbon Dioxide Type Fire Extinguishing System, simple piping, running from one centrally located storage tank, instantly transports clean, non-damaging, non-conducting carbon dioxide anywhere in the plant area...to flammable liquids, electrical equipment, storage spaces, manufacturing processes and record vaults. Fire at any protected location is extinguished in seconds with an absolute minimum of expense and interruption.

Future plant expansion is quickly and economically provided for by initially installing an oversized low pressure carbon dioxide storage tank...capacities range from one to fifty tons. Discharge facilities can be either manual mechanical, manual electric, automatic mechanical, automatic electric or a combination of these...all are easily extensible at a later date.

Don't take chances with future delayed installations; secure the benefits of highly efficient fire protection engineering today...our extensive experience over the years is at your disposal without obligation. Get the facts now!

C-O-TWO

C-O-TWO FIRE EQUIPMENT COMPANY
NEWARK 1 • NEW JERSEY
Sales and Service in the Principal Cities of United States and Canada
Affiliated with Pyrene Manufacturing Company

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers • Dry Chemical Type Fire Extinguishers • Built-In Smoke and Heat Fire Detecting Systems
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems

The Quick, Economical solution to **Heating Gases** and **Process Air**

CHROMALOX Electric Heaters

CHROMALOX offers you a wide variety of electric heaters to fit the temperature requirements of your jobs and the physical dimensions of your equipment. CHROMALOX Units are the dependable, efficient answer to heating recirculating ovens. They quickly and simply convert air-conditioning systems to central heating systems. Units are available for heat treating ovens, annealing ovens, core and armature drying ovens and similar applications. Operating temperatures up to 1000° F. are easily achieved and accurately maintained by thermostat control. Standard units are quickly installed in existing ducts and multiple circuits can be supplied for modulating the heat output.

CHROMALOX

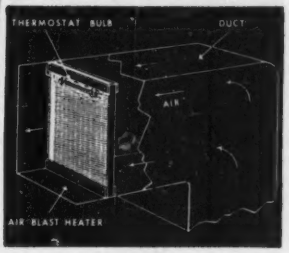
Electric Heat for Modern Industry

:C-87

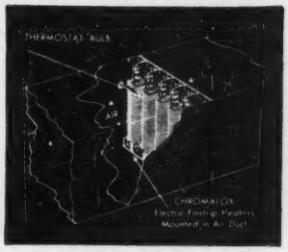
CHROMALOX

dependable, efficient

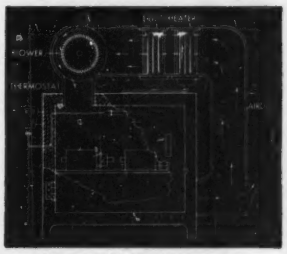
HEAT



Ⓐ **AIR BLAST HEATER** slides into duct for heating air under forced circulation. Two or more heaters may be mounted in same duct. Built-in bus-bar easily connected for single or multiple-circuit control.



Ⓑ **FINSTRIP HEATER** for drying, curing, space heating and other applications requiring heat under forced circulation. Heat is quickly dissipated by parallel-fin construction with minimum air-friction loss. Flanges simplify mounting.



Ⓒ **DUCT HEATER** mounted in recirculation oven for temperatures from 400° to 1000° F. Multi-circuit units allow varying heat outputs.

Want more Know-How?

Send for Catalog 50 and the useful booklet of application ideas "100 Ways to Apply Electric Heat". They are both yours without obligation.

Industrial Heating Division
EDWIN L. WIEGAND COMPANY
7514 Thomas Blvd. Pitts 8, Pa.

ORONITE CHEMICAL COMPANY

THE NAME TO WATCH IN CHEMICALS

Where industry has the "need" Oronite Chemicals supply the way

Most
ORONITE PRODUCTS
are available now—
some are in short supply
Please inquire!

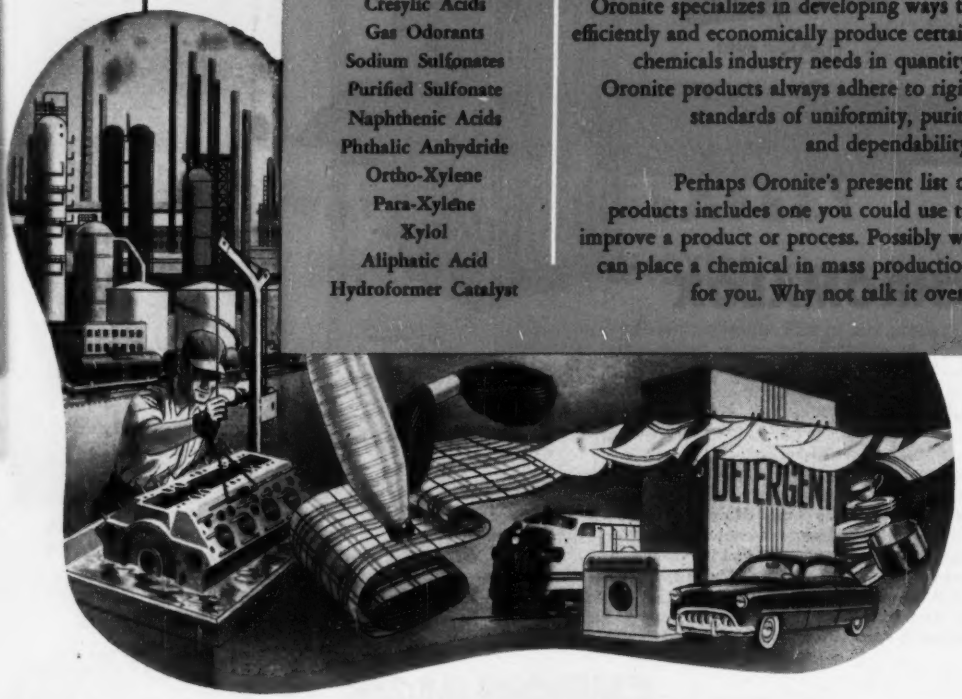
A partial list of products

Detergent Alkane
Detergent Slurry
Detergent D-40
Detergent D-60
Wetting Agents
Lubricating Oil Additives
Cresylic Acids
Gas Odorants
Sodium Sulfonates
Purified Sulfonate
Naphthenic Acids
Phthalic Anhydride
Ortho-Xylene
Para-Xylene
Xylol
Aliphatic Acid
Hydroformer Catalyst

WHEN surface active chemicals were needed in quantity, Oronite found a way to supply them. Today, Oronite produces a variety of surface active agents. Some are oil-soluble, some water-soluble, some soluble in both oil and water; all are versatile products that find wide use by industry.

Oronite specializes in developing ways to efficiently and economically produce certain chemicals industry needs in quantity. Oronite products always adhere to rigid standards of uniformity, purity and dependability.

Perhaps Oronite's present list of products includes one you could use to improve a product or process. Possibly we can place a chemical in mass production for you. Why not talk it over?



ORONITE CHEMICAL COMPANY

38 SANSOME ST., SAN FRANCISCO 4, CALIF. STANDARD OIL BLDG., LOS ANGELES 15, CALIF.
30 ROCKEFELLER PLAZA, NEW YORK 20, N.Y. 600 S. MICHIGAN AVENUE, CHICAGO 5, ILL.
MERCANTILE SECURITIES BLDG., DALLAS 1, TEXAS

2339

For Continuous Processing

Outside view of Vacuum Belt Drier used in processing Holiday Brand soluble coffee.

THEY DESIGNED A SANDVIK STEEL-BELT CONVEYOR INTO A HIGH VACUUM

Steel Belt Withstands Continuous Scraper Action, Heat and Moisture In This Vacuum Drier

In this application, the special abilities of a Sandvik steel-belt conveyor have opened another door to better processing.

It's been the same story in plant after plant. Whether operating as independent units or integrated into special processing equipment, Sandvik conveyors keep on providing new and better answers to processing problems.

BASIC ADVANTAGES—Sandvik conveyors have a solid band of flat, stainless or carbon steel. This provides a smooth, hard, impervious surface that is easy to keep clean, has a high load capacity and a long service life. It can be fitted with simple discharge devices that scrape material off at any point. It can be used to convey materials through ovens. Belts can be of any length or width.

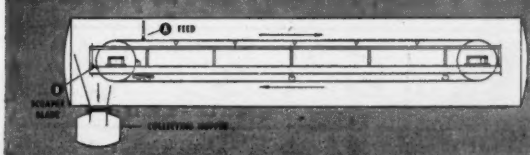
COOLING ARRANGEMENT—Sandvik conveyors can be built with a patented water-bed arrangement which cools from beneath . . . no water gets on top of the band. You can cool and convey, regulate thickness while cooling, cool and strip off gelatinous materials in sheet form, cool loose and pulverized materials, cool solids in sheet form and cool materials in layers.

ENGINEERING HELP—Sandvik's engineering department will be glad to work with you in determining where and how a Sandvik conveyor can improve your processing. Sandvik designs and builds complete conveyors to fit specific jobs.

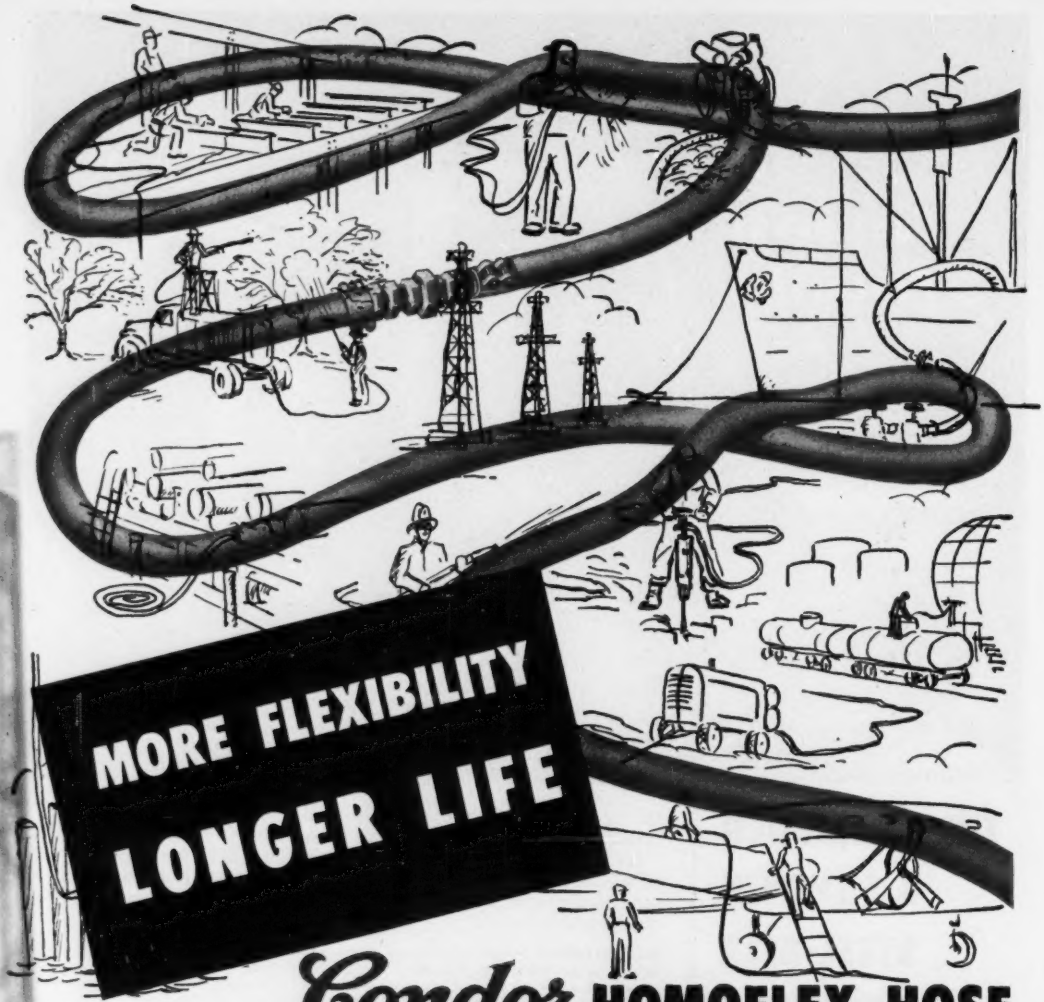
Write, wire or phone for further information.

SANDVIK STEEL, INC., *Conveyor Division*
111 Eighth Avenue, New York 11, N. Y., WAtkins 9-7180
Manufacturers of Steel Belt Conveyors for Over Thirty Years

SANDVIK STEEL BELT CONVEYORS



Schematic drawing shows how Sandvik conveyor operates in soluble coffee continuous vacuum drier designed and built by National Research Corporation for Holiday Brands, Inc. Concentrated coffee solution is sprayed on belt at point A and solidifies on the band as it travels the entire length of the conveyor and returns to point B. Here a scraper blade removes the crystallized coffee off the band into the collecting hopper.

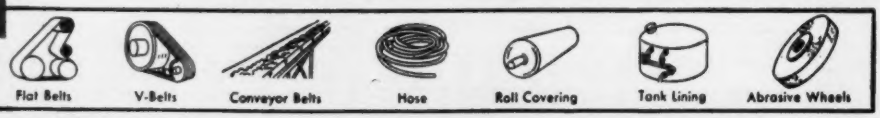


Condor HOMOFLEX HOSE

R/M engineers found a way to practically "homogenize" the wall of Homoflex Hose . . . By ingenious design, rubber tube and cover are blended together inseparably. The result, a hose wall with no pre-set twist, or stiffness. That's why Homoflex Hose is flexible as a rope, light and easy to coil and uncoil. Naturally, it lasts longer too. Made for air, water and other standard uses, Homoflex Hose has additional advantages described in Bulletin 6879D. Write for a copy • As the background suggests, Raybestos-Manhattan makes hose for every use. Your R/M Distributor will show you samples and discuss construction advantages.

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.



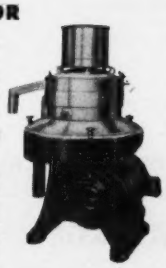
Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Packings • Brake Linings • Brake Blocks Clutch Facings • Asbestos Textiles • Sintered Metal Parts • Bowling Balls

The Answer to Your Centrifugal Problems can be found in this

Complete line of Sharples Continuous Centrifuges

NOZLJECTOR

Solids are continuously discharged from the disc type bowl of this high efficiency centrifuge which is widely used for separation of two immiscible liquids containing solids, or for the concentration of solids in a liquid phase.



to

- SEPARATE TWO IMMISCIBLE LIQUIDS
- CLARIFY LIQUIDS
- REMOVE OR RECOVER SOLIDS FROM SLURRIES
- CONCENTRATE SOLIDS
- CLASSIFY SOLIDS BY PARTICLE SIZE
- DEHYDRATE OR RECOVER CRYSTALS

SUPER CENTRIFUGE

Highest centrifugal force commercially available (13,200 x G) is developed by this tubular bowl continuous centrifuge. Easy to clean, it can be used to separate immiscible liquids with small differences in specific gravity or to effectively clarify liquids.

DY-2 CENTRIFUGE

Solids ranging from firm to slimes and sludges are handled by this versatile centrifuge, with continuous solids discharge. Available as a clarifier to remove solids from liquids; or a separator, to separate two immiscible liquids in the presence of solids.

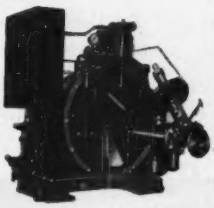
You Can Depend On Sharples— unbiased recommendation based on the most efficient centrifuge for your job.

D-2 CENTRIFUGE

This disc type, continuous centrifuge utilizes the stratification principle which is most effective in concentrating a liquid or solid phase suspended in another liquid.

SUPER-D-HYDRATOR

An extremely flexible, completely automatic centrifuge for recovery and dehydration of crystals. Efficiently handles slurries with 15 to 60% solids. Each step of feed, rinsing and drying can be individually controlled



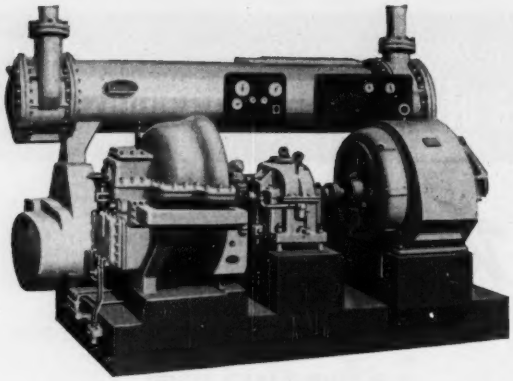
SUPER-D-CANTER

High capacity centrifuge for removal of solids from liquids . . . clarification of liquids classification of solids. Available in two bowl types to accommodate wide range of solids consistencies.

SHARPLES

THE SHARPLES CORPORATION • 2300 WESTMORELAND STREET, PHILADELPHIA 40, PENNA.

NEW YORK • BOSTON • PITTSBURGH • CLEVELAND • DETROIT • CHICAGO • NEW ORLEANS • SEATTLE • LOS ANGELES • SAN FRANCISCO • HOUSTON



How long will a Carrier Centrifugal Refrigerating Machine last?

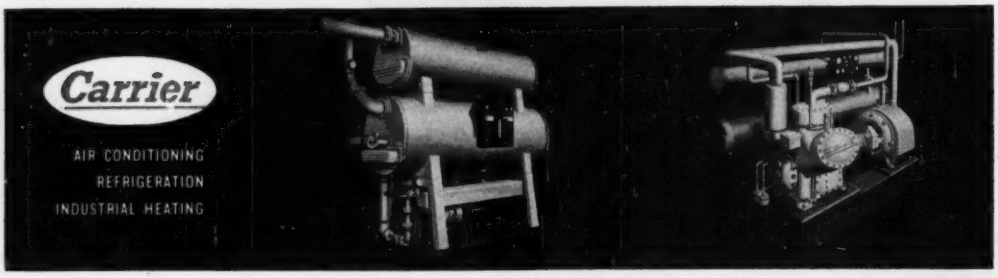
That's the very question that a new owner asked one of our engineers. He wanted to know what the reasonable life expectancy of a Carrier Centrifugal was, how soon he'd have to replace it with a new one.

Our engineer was stumped by the question.

"Frankly," he answered, "we don't know. *We've been making Carrier Centrifugal Refrigerating Machines for over thirty years and the first one we made is running yet!*"

Carrier originated the centrifugal refrigerating machine thirty years ago, so no one has been building them as long as Carrier. Not only that, but Carrier has built more of them—by far—than any other manufacturer.

Are you interested in that kind of dependability? Write to Carrier Corporation, Syracuse, New York.

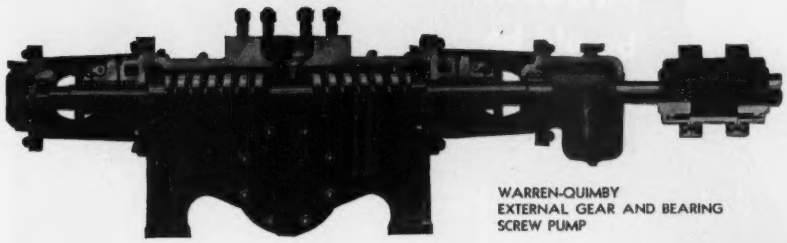


If there's high or low pressure steam available, investigate the exclusive Carrier Absorption Refrigerating Machine—lightweight, has no moving parts.

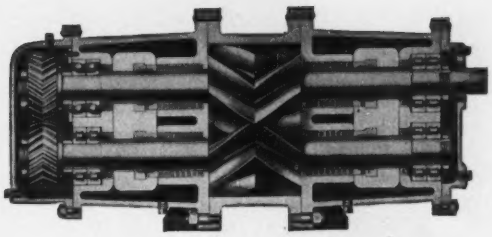
If the job calls for reciprocating type equipment, your best choice is this Carrier Reciprocating Refrigerating Machine in a compact package.

QUIMBY doesn't Quibble

over a tough job . . . a Warren-Quimby Screw or Rotex Pump has what it takes to handle the toughest of pumping assignments in the Chemical Process field; and they accomplish it smoothly, quietly and with no pulsation.



WARREN-QUIMBY
EXTERNAL GEAR AND BEARING
SCREW PUMP

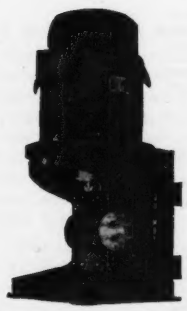


WARREN-QUIMBY ROTEX PUMP
WITH EXTERNAL GEARS

Have you a liquid handling problem involving any of the following materials?

Coal Tar Chemicals	Asphalt	Syrups and Molasses
Oils, Fats and Waxes	Fertilizers	Ceramics
Soap	Wood Products	Dyes
Petroleum Products	Brines	Paints and Varnishes
Drugs and Cosmetics	Cellulose Products	Glass
Paper and Pulp	Greases	Coal By-Products
Acetates	Distillates	Miscellaneous Chemicals

A Warren-Quimby Pump will do the job . . . and on a long-range basis, prove one of the most profitable equipment investments you ever made.



Both Screw and Rotex type pumps are available either horizontal or vertical mounted.

ROTEX • SCREW • CENTRIFUGAL • RECIPROCATING

there's a Warren Pump for practically all pumping applications . . . and our complete line assures an unbiased recommendation.

WARREN QUIMBY PUMPS

WARREN PUMPS

WARREN STEAM PUMP COMPANY, INC., WARREN, MASSACHUSETTS

NOT if you use Chase Copper Water Tube. Many industrial process lines of copper installed years ago are still bright and clean inside.

Chase Copper Water Tube is corrosion-resistant . . . can't choke up with rust. Industrial fluids continue to flow easily because the effective cross-section is maintained.

And, Chase Copper Water Tube cuts repair and replacement costs because it is more durable than rustable pipe.

When installing process lines consider Chase Copper Water Tube and Fittings, solder-joint or flared.

Chase BRASS & COPPER

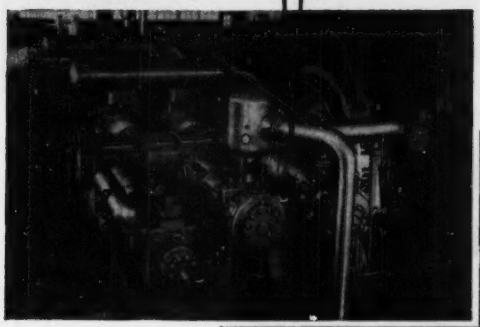
WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

• *The Nation's Headquarters for Brass & Copper*

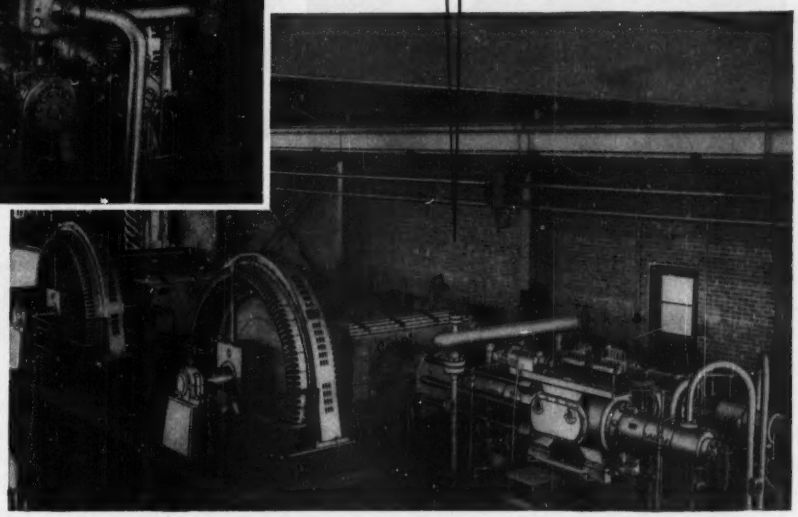
Albany†	Cleveland	Kansas City, Mo.	New York	San Francisco
Atlanta	Dallas	Los Angeles	Philadelphia	Seattle
Baltimore	Denver†	Milwaukee	Pittsburgh	Waterbury
Boston	Detroit	Minneapolis	Providence	
Chicago	Houston†	Newark	Rochester†	(†sales office only)
Cincinnati	Indianapolis	New Orleans	St. Louis	

Nitrogen and Hydrogen Compressed to 15,000 psi pressure

for making Synthetic Ammonia



Two 4-stage HHE primary compressors discharge hydrogen-nitrogen mixture at 3500 psi. Each is driven by a 2250-hp synchronous motor.



Further compression to 15,000 psi is accomplished by the two 900-hp boosters at right. These are two-stage HHE units.

Ingersoll-Rand solves another high-pressure problem...with new HHE compressor installation at Mississippi Chemical Corporation

When nitrogen and hydrogen are brought together under the proper condition of pressure and heat in the presence of a catalyst, the reaction yields ammonia. In the synthetic ammonia plant of the Mississippi Chemical Corporation, at Yazoo City, Miss., these two gases are mated at 15,000-psi pressure . . . with the aid of the four Ingersoll-Rand HHE compressors shown above. The plant's output is used largely as fertilizer, although synthetic ammonia is also an important chemical used to make high explosives.

This installation has two trains of compression, each consisting of a four-stage primary compressor and a two-stage booster unit. The primary unit compresses the nitrogen-hydrogen mixture from 9 psi to 3500 psi, discharging to the intake of the booster unit which completes the compression to 15,000 psi.

The application of high-pressure compressors like these has been one of Ingersoll-Rand's major contributions to process industries. For various synthetic-ammonia processes alone I-R has built successful high-pressure compressors totalling more than 170,000 horsepower. Eight of them were for 15,000 psi; the remainder for pressures from 3,000 to 5,000 psi. The first units are still in operation after 27 years of service at 4500 psi.

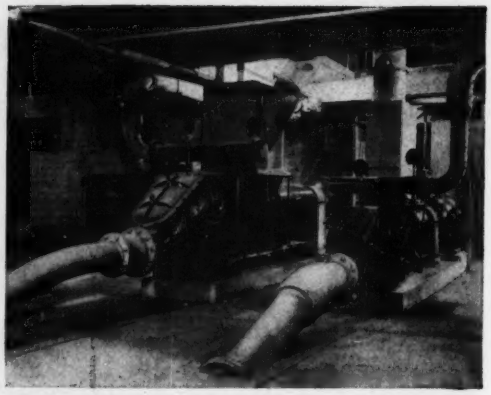
If you have a process-compressor problem, your I-R representative is well qualified to give you expert assistance, no matter what the gas, pressure, or process.

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO BLOWERS
CONDENSERS • CENTRIFUGAL PUMPS • DIESEL & GAS ENGINES

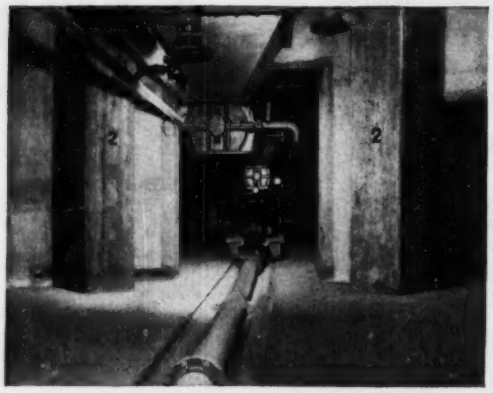
Ingersoll-Rand
11 BROADWAY, NEW YORK 4, N. Y.

787-1

Fuller-Kinyon 9-inch Type H Pump (left) conveys 80 tons of dry, raw materials an hour, a distance of 592 feet; the 8-inch Type H Pump conveys dry, pulverized material a distance of 502 feet from mills to silos.



Fuller-Kinyon 7-inch Type H Portable Pump conveys 400 bbl. of finished cement a distance of 398 feet from silos to packer bins.



DRY, FINE MATERIALS PUMPED LIKE A FLUID

with the

FULLER-KINYON
CONVEYING SYSTEM

Typical Materials Conveyed By Fuller-Kinyon Systems

Asphalt filler dust
Barytes
Bauxite
Catalysts
Cement (Portland)
Cement raw Materials
Chalk
Clays (dried)
Coal (pulverized)
Coke dust
Dolomite (pulverized)
Feldspar
Flue dust
Fly ash
Fuller's earth
Gypsum (calcined)
Gypsum (raw)
Lime
Limestone (pulverized)
Magnesite
Manganese dioxide
Ores (pulverized)
Phosphate rock (pulverized)
Rock dust
Soda ash
Starch

Large quantities of dry, pulverized materials—aerated to the point of fluidity—can be pumped quickly to storage bins and silos, packer bins, bulk-loading stations and between processing points, *just like any fluid.*

The Fuller-Kinyon Conveying System has the advantage of stable operation under varying loads, and offers a wide range of capacities to choose from. The System's network of air-tight ducts allows materials to flow horizontally, vertically, and around corners . . . an economical arrangement for process plants with limited space in which to install pulverized material-conveying equipment.

If your present bulk handling system does not have these advantages—ask a Fuller engineer to survey your set-up. There's no obligation on your part, with a wealth of new facts to be gained on economical conveying.

Fuller

DRY MATERIAL CONVEYING SYSTEMS AND COOLERS—COMPRESSORS AND VACUUM PUMPS—FEEDERS AND ASSOCIATED EQUIPMENT

FULLER COMPANY
Catasauqua, Pa.
120 So. LaSalle St., Chicago 3
420 Chancery Bldg., San Francisco 4

P-135

20,000 c.f.m. at 110 lbs. pressure

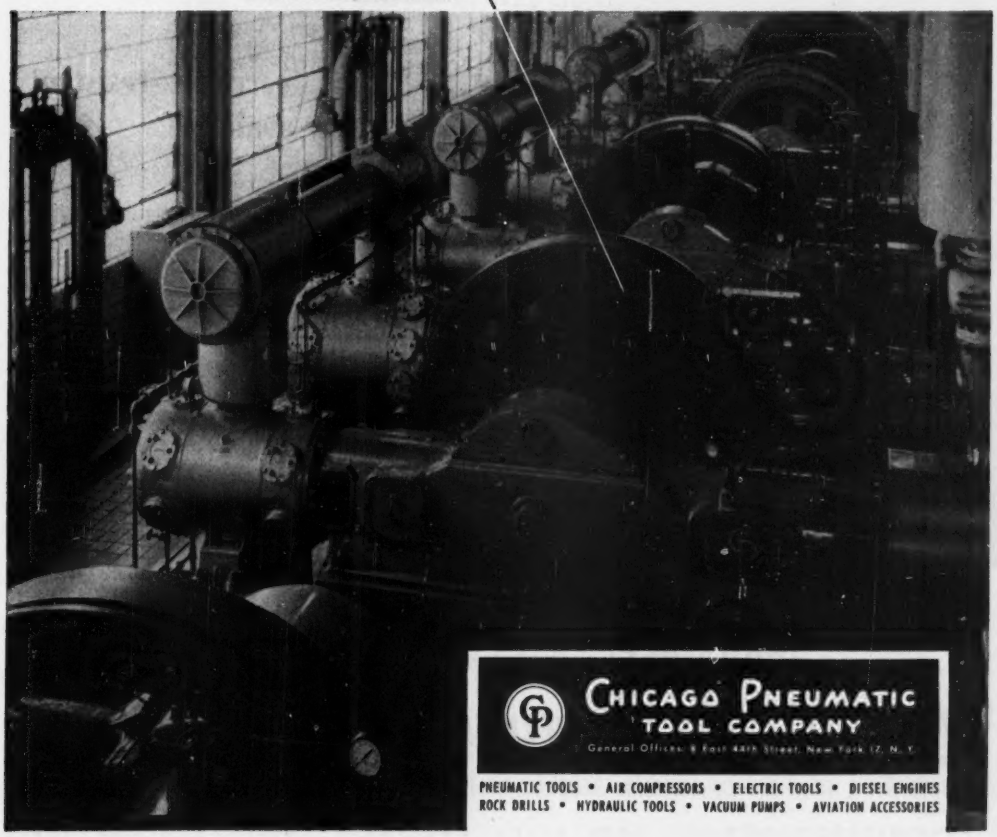
CP Fiftieth ANNIVERSARY

All air requirements of a big automotive plant are met by this battery of five CP horizontal duplex compressors, with a total capacity of 20,000 c.f.m. at 110 lbs. pressure.

The three Type H-DSC steam-driven and two Type O-CE motor-driven units permit a flexibility of operation that assures a dependable supply of air at all times with maximum economy.

Steam-driven compressors are particularly desirable, alone or in combination with electric-driven compressors, where exhaust steam can be utilized for process work or for heating.

Write for complete information



CP CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 6 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

an answer to the shortage of 18-8

REZISTAL 430

strong · corrosion-resistant · readily available

Gutters and downspouts are only one of many applications where Crucible Rezistal 430 Stainless Steel offers an adequate substitute for the 18-8 types of Stainless.

Rezistal 430's chromium content assures its resistance to an impressive list of industrial and natural corrosive media. In many of these, its performance approaches that of 18-8. Rezistal 430 also does well under many conditions involving high temperature oxidation and scaling. And what is most important, you can fabricate it by all the standard methods.

We will be glad to send you more information on the corrosion-resisting and mechanical properties of Rezistal 430, or to advise you on its suitability for your particular application. Write us today.

CRUCIBLE first name in special purpose steels

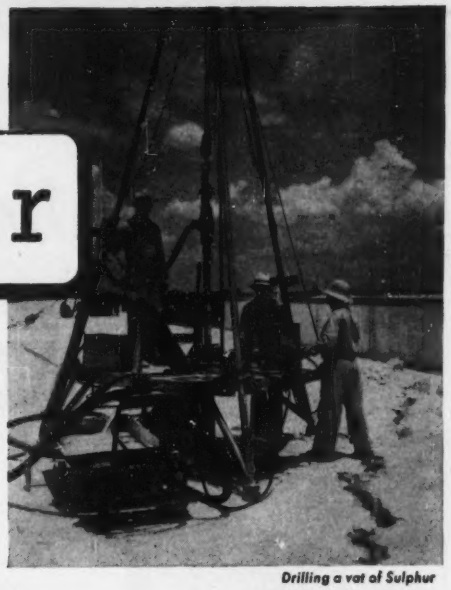
52 years of Fine steelmaking

REZISTAL 430 STAINLESS STEEL

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

STAINLESS • REX HIGH SPEED • TOOL • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

Sulphur



Drilling a vat of Sulphur preparatory to blasting down

Thousands of tons mined daily, but where does it all go?

All through the open seasons—spring, summer and fall—homes everywhere are being painted, old houses as well as new getting much needed protection from the elements. It's an activity seen by millions but few realize how important Sulphur is to this phase of our domestic economy. Actually, it's an essential commodity.

That's right. Paint pigments constitute one of the largest individual consumers of Sulphur . . . in the form of sulphuric acid. Government statistics show that for the year 1950 some 1,260,000 tons of 100% H_2SO_4 were consumed by producers of lead, zinc and titanium pigments. Translated into Sulphur, this means around 400,000 long tons which is a lot of Sulphur! In fact, the pigment industry stands 5th on the list of the many industries that consume Sulphur in one form or another during their manufacturing processes.

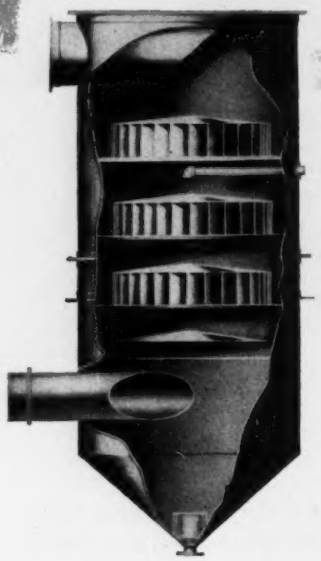
The Sulphur Industry indeed has many mouths to feed, all important to our economy and standard of living.

Texas Gulf Sulphur Co.

75 East 45th Street, New York 17, N. Y.

Mines: Newgulf and Moss Bluff, Texas

Two Years without Maintenance



A dust collector of this design was constructed entirely from 14-gage HASTELLOY *alloy B sheet to resist severe corrosive conditions.*

Handling...

Hydrochloric Acid Vapors
Sulphuric Acid Mist
Nitrous Oxide
Chlorobenzol
Toluol
Aerated Benzol
Aromatic Amides

Three HASTELLOY alloy B dust collectors have just completed 2 years' steady service handling these corrosive chemicals. They are used in a large chemical plant to wash reaction gases and to reclaim many valuable chemicals.

HASTELLOY alloy B has excellent resistance to hydrochloric acid in all concentrations, even to the boiling points. It also has good resistance to sulphuric acid and many other chemicals. The alloy can be fabricated into practically any type of chemical equipment.

For information on the resistance HASTELLOY alloy B has shown to many corrosive media and on fabrication procedures, write for a copy of "HASTELLOY High-Strength, Nickel-Base, Corrosion-Resistant Alloys."

HAYNES TRADE-MARK *alloys*

"Haynes" and "Hastelloy" are trade-marks of Union Carbide and Carbon Corporation.

Haynes Stellite Company
A Division of
Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
Sales Offices
Chicago — Cleveland — Detroit — Houston
Los Angeles — New York — San Francisco — Tulsa

Now! Filter anything from Air to Zynol...

VISKON HAS HIGH POROSITY!

Matches the high porosity of ordinary filter fabrics of the same weight—does the job as good or better than the best!

VISKON HAS HIGH FLOW RATE!

Actually exceeds the flow rate of similar weights and grades of many woven cloth or paper filters.

VISKON RESISTS DETERIORATION!

Last longer under severe filtering conditions—ideal for use in high alkali solutions and for petroleum products.

VISKON IS STRONG WHEN WET!

A big advantage over paper filters! Viskon's high wet strength means longer filter life, greater dependability!

VISKON IS AVAILABLE IN WIDE VARIETY OF SIZES, WEIGHTS!

There's a Viskon filter fabric made for nearly every filtering purpose. Information concerning special applications can be had on request.

VISKON® nonwoven fabrics

—another product to fit today's needs by

THE VISKING CORPORATION
NORTH LITTLE ROCK, ARKANSAS

...Faster, Better and at Lower Cost—with new

VISKON® nonwoven filter fabric

Many **VISKON** users tell us every feature you've ever wanted in a *better* filter is here in new **VISKON**... low-cost, versatility, strength, durability and high efficiency. Amazing new **VISKON** is made from bonded textile fibers, either cotton or rayon or a combination of both. **VISKON** is insoluble in common organic solvents, it has an exceptionally high porosity and is resistant to deterioration. Yet, with all these spectacular advantages, **VISKON** probably *costs less* and gives greater clarity than the ordinary filters you are now using!

Whatever *your* individual needs—filtering anything from Air to Zynol—there's just the right **VISKON** fabric to do a better job. Why not investigate low-cost **VISKON** for *your* operation? Write today for complete information... use handy coupon below.

THE VISKING CORPORATION, Dept. CA, Box 76, North Little Rock, Arkansas
Please rush me additional information about new **VISKON** filter fabrics.

Name.....

Position.....

Company.....

Address.....

City.....*Zone*.....*State*.....

Name of equipment used.....

How will that shiny new machine, appliance or equipment that you manufacture look after six months—a year—five years?

Will bolts and screws show ugly signs of rust? Will nuts corrode, so that their removal requires a hacksaw?

Harper Fastenings of non-ferrous metals and all stainless steels will solve your corrosion troubles—protect the equipment you manufacture throughout its life.

H. M. Harper is the world's largest exclusive producer of bolts, screws, nuts, rivets, studs, washers, cotter pins, of brass, naval bronze, silicon bronze, Monel, nickel, aluminum, and all stainless steels. Over 7,000 items in stock, bringing you these advantages:

All your requirements from one source

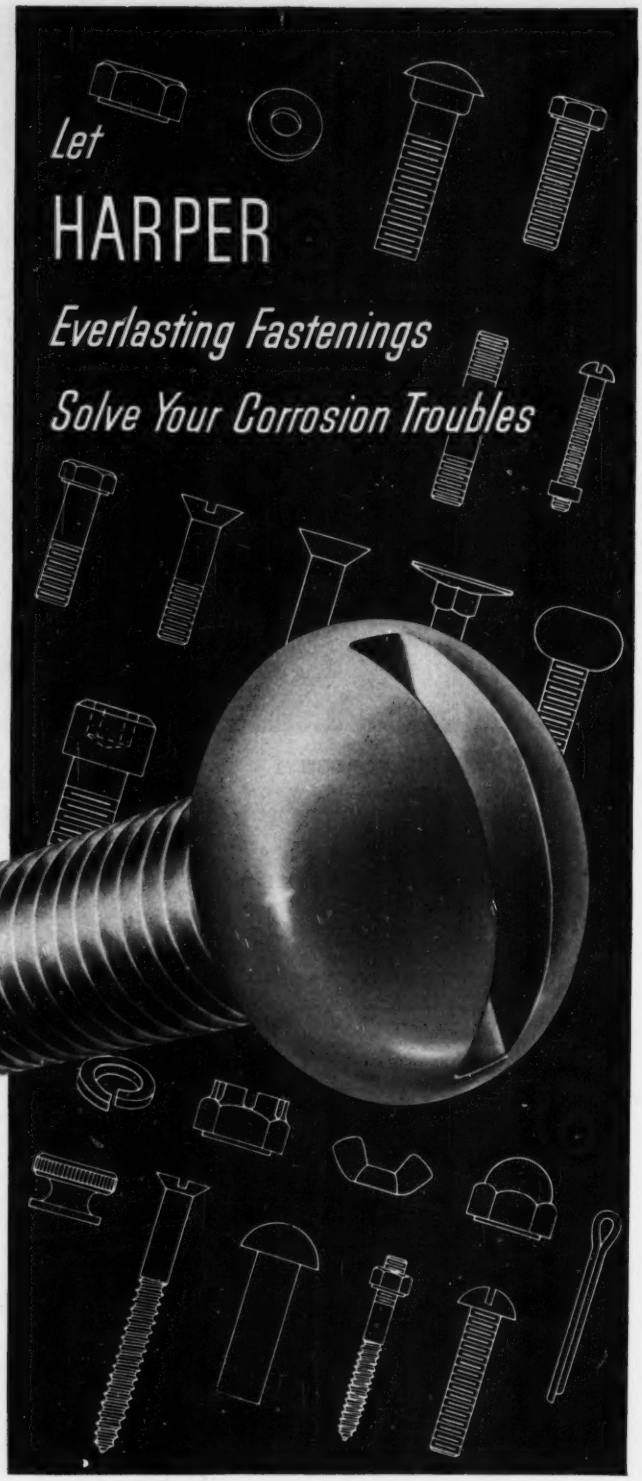
One order to write

One account to keep

One bill to pay

Harper distributors are located in every market area. Back of them is a vast reservoir of metallurgical experience and engineering skill to assist you in solving any corrosion problem.

THE H. M. HARPER COMPANY
8206 Lehigh Ave., Morton Grove, Ill.

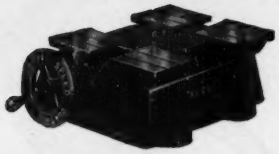


HARPER
EVERLASTING FASTENINGS

10-32 x 1" Round Head, 18-8 Stainless Steel Machine Screw. One of 7,000 fastening items carried in stock.

Reeves Vari-Speed Motor Pulley

converts any standard constant speed motor to a low-cost stepless variable speed drive . . .

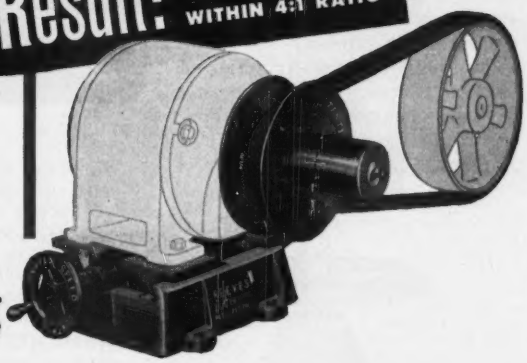


1. REEVES Motor Base provides sliding platform for motor. Handwheel or push-button control increases transmitted speed by moving motor toward driven machine, decreases speed by reversing the operation.

2. Disc Assembly connects directly to motor shaft. Assembly consists of two facing cone-shaped discs—one sliding laterally—and compression spring for mounting as a single unit on motor extension shaft.

3. Special V-Belt hooks up unit with driven machine. Belt fits between discs and over pulley on power input shaft of driven machine. Belt is adjusted to minimum center.

Result: INFINITELY VARIABLE SPEED WITHIN 4:1 RATIO



Unit instantly delivers any desired speed over entire range and maintains that speed without fluctuating even a fraction of an rpm.

The REEVES Vari-Speed Motor Pulley is the easiest, lowest-cost method of converting a machine with fixed speeds into a highly versatile unit of infinitely variable speed adjustability. Thus equipped, it can handle a wider range of work, better, faster and more economically, because machine speed can be changed instantly and accurately—without shutdowns—to meet the needs of every operation and every operator, under every changing condition.

This REEVES unit forms the actual driving element between motor and driven shaft . . . eliminates all auxiliary equipment such as chain drives, gears, belts, etc. . . . requires virtually no more space for installation than any standard belt or chain drive. It is built in eleven sizes, transmitting from ⅛ to 10 hp, over speed ratios up to 4:1.

For complete information on the REEVES Vari-Speed Motor Pulley—either in print or in person—just fill in and mail the convenient coupon at right.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA
Recognized Leader in the Specialized Field of Variable Speed Control

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

Gentlemen:
I would like to have further information, without obligation, on REEVES Vari-Speed Motor Pulley.

☐ Please send catalog CE7-1-G.
☐ Please have REEVES representative call on us.

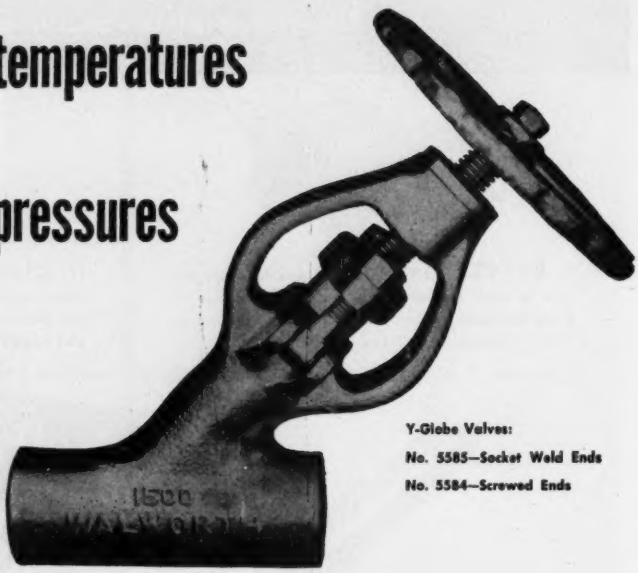
Name _____ Title _____
Company _____
Address _____
City _____ State _____

ACCURATE • VARIABLE
Reeves Speed Control
GIVES THE RIGHT SPEED FOR EVERY JOB!

Walworth's NEW small cast steel valves

SERIES 1500 – SIZES ¼ to 2 inches

handle HIGH temperatures
HIGH pressures



Y-Globe Valves:
No. 5585—Socket Weld Ends
No. 5584—Screwed Ends

Walworth is proud to make these new Small Cast Steel Valves available to power stations . . . oil refineries . . . ships . . . wherever piping is subject to severe pressures and temperatures. Non-shock service ratings of these valves: 1500 psi–950F for steam; 3600 psi–100F for water, oil or gas. Cast of chromium molybdenum steel, they are compact and light, yet exceptionally strong. Both Y-Globe and Angle type valves are available.

Angle Valves:
No. 5587—Socket Weld End
No. 5586—Screwed End

Simplified Walworth design eliminates many of the valve problems encountered in high pressure service. Among the features of this new valve are:

INTEGRAL BODY AND YOKE – made from a single casting without threading or welding. Bonnet joint — always a potential source of leakage — is eliminated. Valves can be reassembled quickly and easily.

ROTATING DISC – prevents valve seat distortion and consequent leakage. Cuts down replacements.

WELDED SEAT RING – compensates for changes in pressure and temperature—eliminates a major source of leakage.

SPECIAL BACK SEAT BUSHING – permits repacking the valve under pressure with greater safety.

PACKING CHAMBER – designed to dissipate heat thus keeping packing rings at lower temperatures—gives them longer life.

These valves are available with either socket weld ends or screwed ends, in sizes ranging from ¼ to 2 inches. For further information on Walworth series 1500 Small Cast Steel Valves, see your local Walworth distributor, or write for Circular No. 134.

WALWORTH

valves • fittings • pipe wrenches

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

ADVERTISEMENT—*This entire page is a paid advertisement* *Prepared by U. S. Industrial Chemicals Co.*

U.S.I. CHEMICAL NEWS

July ★ A Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★ 1952

Sulfur Dichloride Vapor Aids Paint, Ink Drying

Development of an unusual method for drying coatings of ink, paint, or varnish with sulfur dichloride vapors was reported recently. Said to be adaptable to such operations as oilcloth and linoleum manufacture, furniture and appliance finishing, and many types of printing, the process consists of passing the coated material through a chamber where sulfur dichloride vapors react with the coating and harden it within a few seconds. The mechanism of the reaction is not definitely known. It is thought to involve an addition reaction with drying and semidrying oils, and a substitution reaction if the oils are of the nondrying type. In addition, copolymerization effects have been suggested, and the process has been likened to the vulcanization of rubber. The reaction is said to produce a hard film or deposit in 10 seconds or less in the case of unsaturated oils, and in 30 seconds with saturated ones. A cleaning step follows contact with the vapor since sulfur dichloride can have a deleterious effect on the material being coated or printed.

Ethyl Alcohol Helps Speed New Corn Syrup Analysis

A new procedure for separating dextrose, maltose, and dextrin fractions from corn syrup, developed recently at a government laboratory, is said to yield more accurate results and to cut time required for the analysis to 1½ hours. Apparatus required consists of a simple glass column filled with equal weights of carbon adsorbent and a diatomaceous earth filler. The top of the tube is coupled to a nitrogen source so that 30 to 50 pounds pressure can be applied to increase the liquid flow rate. Sample to be analyzed is passed through the column, after which water is run through to remove the adsorbed dextrose, leaving the other two fractions intact. Next, a 5 per cent ethyl alcohol solution removes the maltose fraction, and finally dextrin is removed with a 15 per cent ethyl alcohol solution. At the end of the run, a wash with 95 per cent ethyl alcohol and then with water removes all traces of carbohydrates.

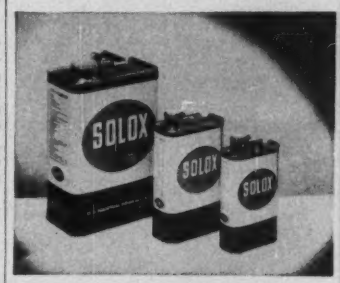
Develop New Type Bandage

A new type of cotton bandage developed by the U. S. Department of Agriculture is now being made commercially for the Armed Forces and may soon be available for civilian use, according to a recent announcement. The outstanding feature of the new bandage is its ready adaptability to irregular contours of the body. This property is achieved by allowing ordinary open-weave gauze to shrink freely in a 20 to 30 per cent caustic solution, followed by washing and drying under a minimum of tension. In shrinking, the yarns develop a high degree of crimp and elasticity, making the bandage essentially self-fitting and self-tightening, it is claimed. The modified gauze is non-slipping and said to be especially suitable for bandaging joints where a close fitting but flexible dressing is required.

Versatility Makes U.S.I. Solox Ideal General Purpose Solvent For Industry, Home, Farm Use

U.S.I.'s Proprietary Alcohol Solvent Widely Used As Shellac Thinner, Boat and Camp Stove Fuel, General Cleaner; Comes in Handy Containers

Solox, U.S.I.'s popular all-purpose denatured alcohol solvent, has long enjoyed a reputation for being a utility product with dozens of applications. Solox is a fast, efficient solvent having a mild, non-residual odor. It is noncorrosive and burns with a hot, clean, smokeless and odorless flame without leaving a residue. Careful control of the manufacturing process insures a uniform product which conforms to U.S.I.'s narrow specification limits.



In addition to its versatile properties, convenient packaging has further increased the value of Solox to all users. It is readily available from paint, hardware, and many department stores throughout the country in easy-to-handle and easy-to-pour pint, quart, and gallon containers. For larger users, the solvent is available in conventional 5 and 54 gallon drums, as well as in tank wagons and tank cars.

Denatured ethyl alcohol, from which Solox is formulated, is the only thinner suit-

MORE

Vitamin B_{12} Plays Role In Egg Production

Experiments carried out at a leading university have shown that laying birds consuming a marginal level of protein in the ration were helped by adding vitamin B_{12} to the feed. It was found that the vitamin B_{12} aided the birds in making more efficient use of available protein, thereby increasing egg production. The incidence of feather picking with birds fed vitamin B_{12} and soybean meal was less than with birds fed fish meal.

From these experiments, it is evident that vitamin B_{12} plays an important role in protein utilization.

Synthetic 'Guinea Pigs' Produced with Cortisone Help Medical Research

Synthetic "guinea pigs" are the latest marvels to be produced with the help of cortisone, according to recent reports. These are laboratory animals which, after receiving cortisone treatments, become subject to human diseases they would not ordinarily get. Rabbits, for example, have been made to contract typhoid fever after being given large doses of cortisone. Mice have been made susceptible to a number of other human diseases by combination treatments with cortisone and X-rays, it is claimed.

New Pain Killing Drug Effective for 10 Days

A drug which is claimed to relieve pain for ten days following surgery was revealed at a recent medical society meeting. Described as a local anesthetic which numbs the nerves, the drug is injected at the site of the operation or into the nerve trunks leading to the site. By the time the drug wears off, the wound often no longer hurts, say the doctors who demonstrated its use. In chest and abdominal operations, the freedom from pain gained by using the drug allows patients to move about much earlier than is usually possible, which is claimed to be good medicine in itself.

Ozone-Resistant Rubber May Yield Colorful Tires

Tires that match the color of the paint on your car may soon be possible with a new synthetic rubber now being produced in pilot plant quantities. The new material, known as chlorosulfonated polyethylene, is described as chemically different from existing types of rubber. It is reported to have remarkable resistance to wear, heat, and weather, and to be completely resistant to the corrosive effects of ozone, the constituent of the atmosphere responsible for the deterioration of natural and many synthetic rubbers. Good physical properties can be attained without the addition of carbon black, it is claimed, and colored fillers, substituted for black, are expected to make possible the manufacture of rubber products, including tires, in various colors.

ADVERTISEMENT—*This entire page is a paid advertisement* *Prepared by U. S. Industrial Chemicals Co.*

July ★ **U.S.I. CHEMICAL NEWS** ★ 1952

CONTINUED

Solox Solvent

able for use with shellac. The mild odor and superior solvent action of Solox make it ideal for all shellac purposes—for thinning, for softening and removing old shellac, for cleaning and brightening shellacked surfaces, and for cleaning shellac brushes. Furniture refinishers have also found Solox an excellent diluent for non-grain raising stains to obtain the desired depth of color shade.

Marine, Camp Stove Fuel

Solox is popular with boat owners and campers as an easily handled and efficient fuel for alcohol-burning stoves. Solox is also widely used to kindle fires in outdoor charcoal grills, and it is a superior fuel for chafing dishes.

Solox is an effective general-purpose cleaner. Mixed with either plain or soapy water, it is excellent for cleaning grease and grime from painted walls and woodwork. Used straight, it is an efficient cleaning agent for a diversity of products including linoleum, motors and machinery parts, typewriters, and jewelry. Miscellaneous applications for Solox include its use as a solvent for rosin to be painted on young fruit trees as a repellent, as an aid in ironing clothes, and in photography to dry prints and negatives.

Industrial Uses

Industrial use of Solox is large and continually expanding. Demand for the solvent comes from a wide variety of industries where alcohol is required but where the use of a specially denatured alcohol formula is not essential. U.S.I.'s local sales offices in all principal cities will welcome the opportunity to answer inquiries regarding Solox.

New Silicone Booklet

Descriptions and uses of silicones are illustrated and indexed in a new booklet designed to provide quick access to information on polishes, water repellents, release agents, lubricants, defoamers, protective coatings, and other silicone applications.

New Electronic Method Measures Oil in Soybeans In 15 Minutes or Less

A new method is reported to reduce time required for determining oil content of soybeans to 15 minutes or less as contrasted with the several hours required by the official method now in use. The method centers around use of a high-frequency oscillator to measure the oil in solution of standard solvent. Soybean samples are first ground in a special grinder-extractor with the solvent. After filtering, the solvent-oil mixture is placed in the cell of an electronic oscillator which measures the dielectric constant. The reading is then converted to per cent oil by means of a table obtained from analysis of a large number of soybean samples by the customary method. Results on a single sample can be obtained in 15 minutes, but in quantity, 20 to 30 determinations per hour could be made by two analysts, it is said. Estimated cost of the equipment, if used at capacity, is claimed to be about one-half that of the equipment needed for testing the same number of samples by the present method.

New Photo-Copying Method

An experimental photographic system for making quick, inexpensive copies of documents in less than a minute was demonstrated recently. All equipment for the operation is contained in a unit slightly larger than a standard typewriter, and average room lighting conditions are used. The process involves use of paper coated with a special emulsion which, although light sensitive, is too slow to be affected by ordinary lighting. When the paper is exposed with a document to a bright light and then placed in a special activating solution, a master image composed of soft photogelatin and dye is quickly formed. When this image is placed in contact with a sheet of plain white paper, a thin layer of the dyed gelatin is transferred to the paper, forming a positive of the original. Since the reproductions do not come in contact with the activating solution, they come out virtually dry and can be used immediately, it is said.

TECHNICAL DEVELOPMENTS

Information about manufacturers of these items may be obtained by writing U. S. I.

To prevent clogging of spray guns without pre-straining paint, a midget strainer is available which fits the suction tube of commercial sprayers and strains the paint as it leaves the gun. **(No. 820)**

An anti-static and cleaning solution for acrylic plastics can be applied by brush, spray, dip or cloth, is non-inflammable, and is said to prevent surface attraction of dust and dirt which cause scratches. **(No. 821)**

A new magnetic gage measures thickness of paint films, sheets of rubber, plastics, other non-ferrous materials, applied to or laid over any iron or steel surface, the manufacturer states. **(No. 822)**

Plywood gluing is speeded and simplified by a new portable electric unit which reportedly sets glue almost instantly, spot-welds panels into place and eliminates need for nails or brads. **(No. 823)**

A new salt of methionine is now available to the pharmaceutical trade which will enable the industry to prepare a more soluble derivative for medical use. **(No. 824)**

Pipe and boiler scale can be removed quickly and safely with a new solvent now on the market. Water is said to remain safe for drinking after use of the solvent. **(No. 825)**

To eliminate wall moisture and blistering and peeling of painted walls, aluminum devices are available which, when inserted into clapboard walls, are claimed to "exhale" moisture. **(No. 826)**

A non-abrasive "liquid sandpaper" now on the market is said to replace sanding and heavy cleaning of hardwood floors, inlaid linoleum, and the like, to leave no residue, and to require no rinsing. **(No. 827)**

Plastic sections as thin as 4 microns can be cut with a new microtome designed for hard materials. Device can also be used for sectioning all types of wood, metals, and elastic materials, the manufacturer states. **(No. 828)**

Concrete floors can be patched and put into use immediately, it is said, with a new ready-mixed material which is tamped into the cleaned and primed hole and sealed with a powder. **(No. 829)**

A new line of protective hand creams, believed to be the first to incorporate bacteriostatic properties, reportedly offers protection against oils, greases, dilute acids and alkalis, and organic solvents. **(No. 830)**

PRODUCTS OF U.S.I.

ALCOHOLS
Amyl Alcohol (Isoamyl Alcohol)
Butanol (Normal-Butyl Alcohol)
Fusel Oil—Refined
Propanol (Normal-Propyl Alcohol)

Ethanol (Ethyl Alcohol)
Specially Denatured—all regular and anhydrous formulas
Completely Denatured—all regular and anhydrous formulas
Pure—190 proof U.S.P., Absolute—200 Proof
Solox*—proprietary solvent—regular and anhydrous

ANTI-FREEZE
Super Pyro* Anti-Freeze
U.S.I. Permanent Anti-Freeze

ETHERS
Ethyl Ether, U.S.P.
Ethyl Ether, Absolute—A.C.S.

ACETONE — A.C.S.

ANSOLS
Ansol* M
Ansol* PR

ACETIC ESTERS
Amyl Acetate—Commercial and High Test
Butyl Acetate
Ethyl Acetate—all grades
Normal-Propyl Acetate

OXALIC ESTERS
Dibutyl Oxalate
Diethyl Oxalate

PHTHALIC ESTERS
Diamyl Phthalate
Dibutyl Phthalate
Diethyl Phthalate

OTHER ESTERS
Diatol*
Diethyl Carbonate
Ethyl Chloroformate

RESINS (Synthetic and Natural)
Arochem*—modified types
Arodure*—urea-formaldehyde resins
Arofene*—pure phenolics
Aroflat*—for special flat finishes
Aroflint†—room temperature curing phenolic
Areplax*—alkyds and allied materials
Aropol†—copolymer modified alkyds
Ester Gums—all types
Natural Resins—all standard grades

INSECTICIDE MATERIALS
CPR Concentrates: Liquid & Dust
Piperonyl Butoxide
Piperonyl Cyclonene
Pyrenone* Concentrates: Liquid & Dust
Pyrethrum Products: Liquid & Dust
Rotenone Products: Liquid & Dust

INSECTIFUGE MATERIALS
Indalone*
Triple-Mix Repellents

INTERMEDIATES
Acetoacetanilide
Acetoacet-ortho-chloroanilide
Acetoacet-ortho-toluidide
Acetoacet-para-chloroanilide
Ethyl Acetoacetate
Ethyl Benzoylacetate
Ethyl Sodium Oxalacetate

FEED PRODUCTS
Calcium Pantothenate (Feed Grade)
Curbay B-G*
DL-Methionine (Feed Grade)
Niacin, U.S.P.
Riboflavin Concentrates
Special Liquid Curbay*
U.S.I. Vitamin B_{12} and Antibiotic Feed Supplements
Vacatone* 40

OTHER PRODUCTS
Collodions
Ethylene
Methionine (Pharm. Grade)
Nitrocellulose solns.
Propionic Acid
PiB*—Liquid Insulation
Special Chemicals and Solvents
Urethan, U.S.P.
Acetaldehyde
Propionaldehyde

*Reg. U.S. Pat. Off.
†Trademark Pending

U.S.I INDUSTRIAL CHEMICALS CO.
Division of National Distillers Products Corporation
120 BROADWAY, NEW YORK 5, N. Y. BRANCHES IN ALL PRINCIPAL CITIES

NOW AVAILABLE

Reprints of last month's Chemical Engineering Report on

Process Instrumentation

Chemical Engineering's third report in a 23-year period on this subject, comprises a 48-page article section and a 16-page folded chart, the latter serving as a Guide to Process Instrumentation Elements.

ARTICLES:

- New Tools for the Process Engineer
- New Tools for the Instrument Engineer
- Process Control by End-Point Analysis
- Instrumentation Pays Its Own Way
- A Critical Look at Graphic Panels
- Instruments: Equipment Not Accessories
- Push-Button Plants: When and How?

CHART:

- In 27 sections and more than 200 illustrations, describes main features of about 350 instruments, telemeters, controllers and final control elements. Approach emphasizes factors involved in preliminary choice, such as principle of operation, range, accuracy and types of application. Guide is unique; nothing like it has previously been in existence.

PRICES:

Chart, folded: 35¢ (ask for reprint 189).

Article section: 75¢ (ask for reprint 190).

Combination of chart plus article section: $1 (ask for reprint 191).

Flat charts for wall use (two charts rolled in mailing tube, to show both sides: $1 (ask for reprint 189a).

Multiple-Copy Orders: Special discounts from single-copy prices are available for quantities above ten. Write for discounts applying to quantity desired.

Student prices: Chart alone, any quantity: 15¢ each. Article section alone, any quantity: 35¢ each. Combination, any quantity: 50¢.

Please send remittance with order. Address:

Chemical Engineering
Attention: M. Molin
330 West 42nd St.,
New York 36, N. Y.

Whitlock Type KR Reboiler — for conventional evaporation service. Tube bundle positioned low in shell — minimizes shell size. Design properly considers heat flux, boiling rates, vapor disengagement, fouling, etc. Write for Bulletin 130.

Evaporating

Whitlock Type ST Exchanger — floating tube sheet (split ring) construction. Longitudinal split flow baffle design for optimum vapor distribution over condensing surface. Also adaptable to cooling and heating services. Write for Bulletin 945.

Condensing

Whitlock Type S Heater — straight tube, floating head (pull through) type. Designed for easy access to tube bundle . . . for simple maintenance. Particularly applicable to heating of dirty, fouling liquids. Write for Bulletin 945.

Heating

Whitlock Type SG Cooler — outside packed (lantern gland) rear closure. Avoids danger of interleakage through gasketed joint. Fabricated of stock components to standardized details . . . available for wide range of oil and water cooling requirements. Write for Bulletin 122.

Cooling

YOU NAME IT...WE MAKE IT...

Whatever the type of service, there's a Whitlock Heat Exchanger that's right for the job. Our engineering, designing, manufacturing, and testing facilities are at your disposal. Write for descriptive Bulletins, or send specifications on your particular requirements. The Whitlock Manufacturing Co., 94 South St., Hartford 10, Connecticut.

WHITLOCK

Whitlock designs and builds — bends, coils, condensers, coolers, heat exchangers, heaters, piping, pressure vessels, receivers, reboilers.

Baker Platinum Laboratory Ware

Production of platinum laboratory ware has been a specialty of ours for almost three-quarters of a century, and we have devoted a great deal of research and experiment to improving it.

This work has been aided greatly by the fact that we maintain and operate large scientific laboratories and use our own platinum ware in them.

Thus, the ware is subjected to day in, day out tests through use, and practical experience has brought about a number of improvements, among which are:

Improvements in metallurgical processes which have increased its useful life — development of the platinum-rhodium alloy which is now so widely used — design changes like the reinforced rim on crucibles and dishes — development of the low form crucible — improvements in the design of platinum electrodes.

You run no risk in making Baker Platinum Laboratory Ware standard equipment.

BAKER & CO., INC.

113 Astor St., Newark 5, N. J.

NEW YORK SAN FRANCISCO CHICAGO

FROM THE CASEBOOK THAT COVERS THE INDUSTRY

YORK Refrigeration Helps Process Saran in Huge Midwestern Chemical Plant

Modern industrial cooling demands reliability and operating economy in refrigeration equipment.

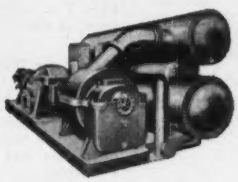
That's why you'll find York at work throughout a giant midwestern chemical plant. Here mix needed for making saran is processed in jacketed vats at 95° F. After several hours, the hot water is quickly removed from the jacket and brine, previously cooled to –25° F. by York refrigeration equipment, surges in.

This vital step requires cooling equipment that can plunge the temperature of large quantities of brine down, and *keep* it down, day in and day out—without breakdown or faltering.

Saran is only one of the many valuable products—old and new—that are produced more efficiently with York refrigeration. Whether you're operating a multi-million dollar colossus or a small factory, York cooling equipment —air conditioning, refrigeration, ice-making—can be tailored with micrometer exactness to save you time, space and money.

In addition to this wide range of equipment, York maintains a coast-to-coast network of Branch Offices for on-the-job service—each is staffed with York-trained engineers familiar with every phase of industrial cooling. Your nearest York Branch Office is as near as your telephone. Call today or write directly to York Corporation, York, Penna.

The great new Superliner, S. S. United States, has York Air Conditioning and Refrigeration.



YORK TURBO SYSTEM

Capacities range from 150 to 1500 tons. Steam turbine or electric motor-driven. For air conditioning large buildings . . . for refrigeration of industrial processes.

THE BIG ADVANCES COME FROM **YORK**

HEADQUARTERS FOR MECHANICAL COOLING . . . SINCE 1885

how to chelate

(pronounced "Key-late")

.... Versene*

VERSENE* CHELATES CATIONS

Before you can chelate foreign metallic ions in solutions you must have a powerful chelating agent such as Versene. This is a compound that will inactivate cations with the formation of inner ring structures in the molecule. It makes the metallic ion become part of the rings. This is a valuable thing to know because it will prevent all kinds of contamination caused by cations.

PREFERENTIAL CHELATION

When Versene is added to a mixture of various metallic ions chelation will be preferential. That is, one metal will be complexed before another. When the first is exhausted the second will be inactivated and the process will go on until either metallic ions or Versene are used up. Page 7 of Section I of Bersworth's Technical Bulletin No. 2 gives a table which shows the order of chelation of some of the common metals at various pH's. Send for it.

VERSENES* — POWERFUL CHELATING AGENTS

The Versenes, made only by the Bersworth Chemical Company under processes originated, developed and patented by F. C. Bersworth, are the most powerful chelating agents known. They are exceptionally stable at high temperatures and all pH's. Quality standards of manufacture are so high that uniform complexing power is guaranteed for *either* sample or carload quantities. Ask for Technical Bulletin #2. Write Dept. B for samples. Chemical counsel available.

"Chemistry's most precise chemicals"

VERSENE* WATER TEST KIT. Tells Total Hardness in 2 minutes. Accurate to 1 grain per gal. Versenate method. Complete with instructions $5.00 Postpaid.

*Trade Mark Registered

BERSWORTH CHEMICAL COMPANY

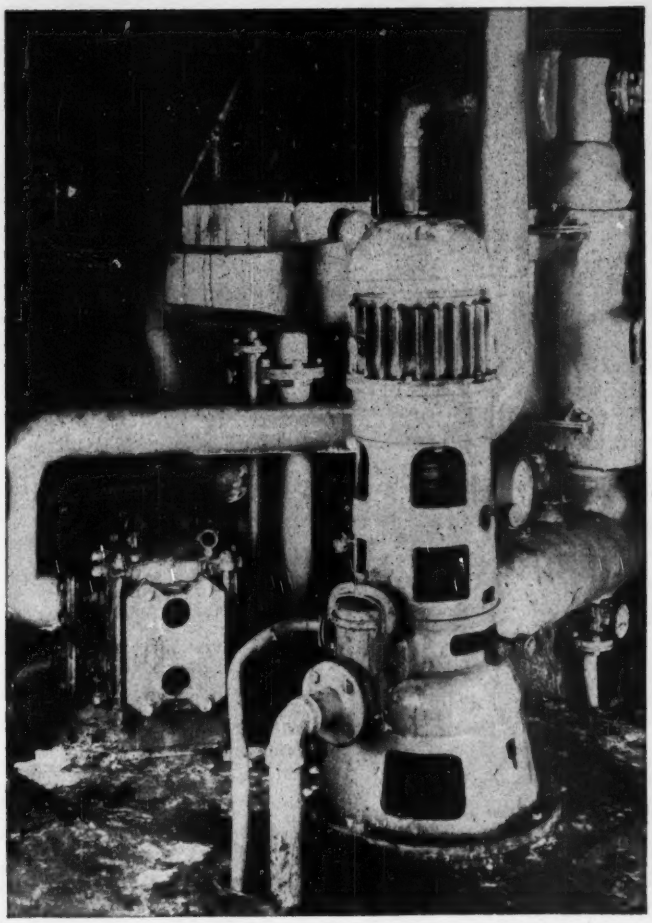
FRAMINGHAM, MASSACHUSETTS

Warehouse Stocks:

George Mann — Providence, R. I.
Griffin Chemical Co. — San Francisco — Los Angeles
Siegel Chemical Co. — Brooklyn, N. Y.
Barada & Page, Inc. — Dallas — Houston — New Orleans — Oklahoma City — St. Louis — Tulsa — Wichita
Wasatch Chemical Co. — Salt Lake City
Kraft Chemical Co. — Chicago
C. S. Tanner Co. — Charlotte, N. C.

Copyright 1952 Bersworth Chemical Co.

Pump doing a SPECIALTY ACT



Here's a LaBour Type G pump in a chemical plant near Birmingham, England, that hasn't had a day off since it was first put in operation more than two years ago. It's handling phosphoric acid on continuous duty, and the owners report "complete satisfaction."

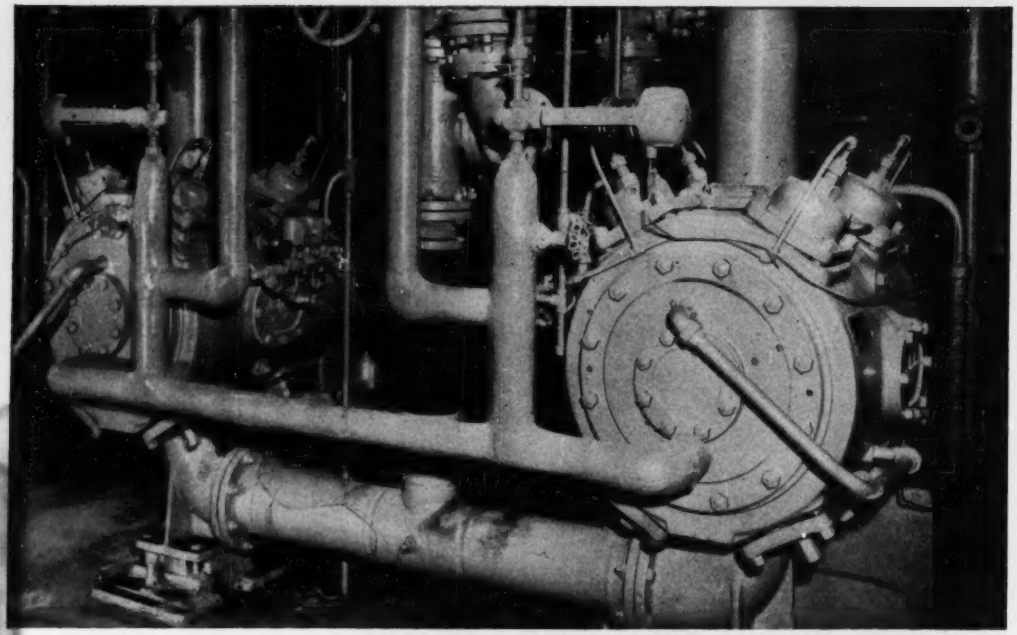
You can be sure of complete satisfaction when you put your liquid-moving problems up to LaBour, because LaBour has been solving the tough ones for the chemical industry since the mid-twenties. Simplicity of design, coupled with the most rigid standards of manufacture and test, make LaBour pumps *dependable.*

True operating costs stay way down when you eliminate expensive service interruptions—and that's LaBour's specialty.

ORIGINAL MANUFACTURERS OF THE SELF-PRIMING CENTRIFUGAL PUMP

LABOUR

THE LABOUR COMPANY, INC. ★ Elkhart, Indiana, U.S.A.



CONTINUOUS OPERATION of this Worthington Type DC Horizontal Compressor helps keep aureomycin production up at Lederle Laboratories plant in Pearl River, N. Y.

Compressor operates continuously to help produce aureomycin

Installed for Lederle Laboratories in 1949, unit operates at 100% capacity day and night.

No rest periods for this duplex compressor. When you're producing antibiotics like aureomycin, you just can't afford them!

The Lederle Laboratories Division of American Cyanamid Company anticipated rigorous operating requirements when they installed this Worthington horizontal compressor back in 1949.

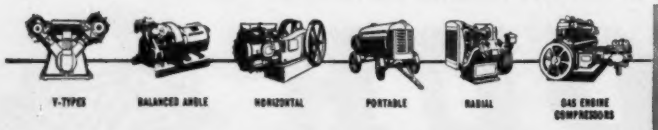
They wanted it to supply compressed air for use in the production of aureomycin—24 hours a day, seven days a week, at 100% capacity. The fact that the unit has operated since installation in 1949 with no attention other than routine maintenance is but "normal" for a sturdy Worthington compressor like this one.

This Type DC compressor has the exclusive Worthington Feather* Valve, deep, full-area cylinder water jackets, extra-large bolted gasketed clean-out covers—just some of the reasons why *there's more worth in Worthington.*

Remember Worthington's auxiliary equipment, too. Write to Worthington Corporation, Compressor Division, Buffalo, New York.

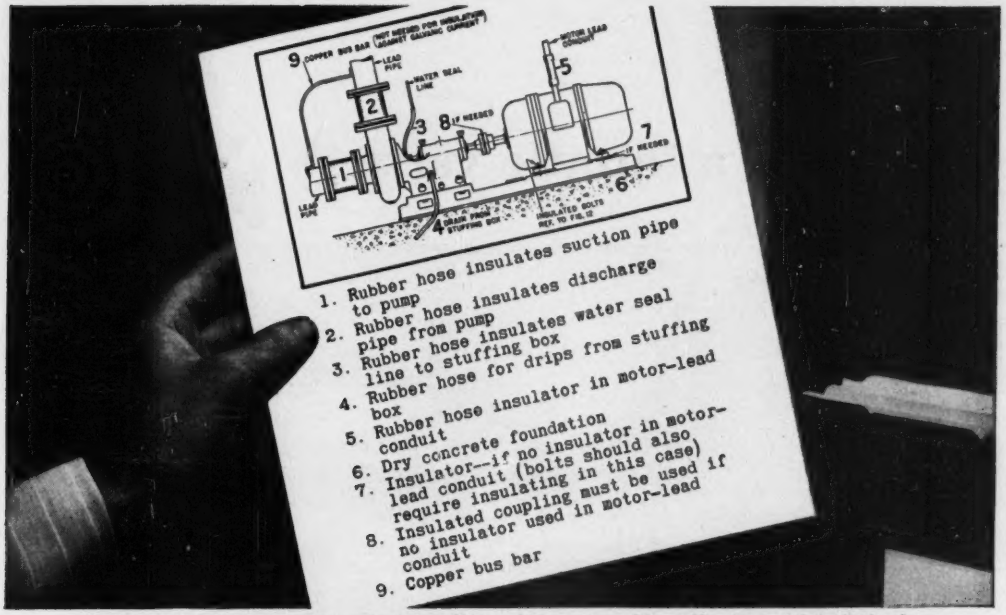
*Reg. U. S. Pat. Off.

K.2.1



No Other Compressor Will Outperform a Worthington

WORTHINGTON
Compressors


1. Rubber hose insulates suction pipe to pump
2. Rubber hose insulates discharge pipe from pump
3. Rubber hose insulates water seal line to stuffing box
4. Rubber hose for drips from stuffing box
5. Rubber hose insulator in motor-lead conduit
6. Dry concrete foundation
7. Insulator—if no insulator in motor-lead conduit (bolts should also require insulating in this case)
8. Insulated coupling must be used if no insulator used in motor-lead conduit
9. Copper bus bar

ANOTHER CASE STUDY FROM THE WORTHINGTON FILES. This data sheet from the Worthington files indicates points at which an alloy pump should be insulated in order to eliminate stray-electric-current corrosion in an electrolyte circulating system. The solution to this problem was arrived at from very careful consideration and investigation by Worthington engineers working in conjunction with the pump user. The resulting installation—made some eleven years ago—was one of the first in the world where alloy (Worthite) pumps were used to circulate an electrolyte.

Another Pumping Problem That Called For More Than a Pump!

A check of the Worthington files would uncover many stories like this one. They're the best evidence we have of the "extras" you get with every Worthite* pump.

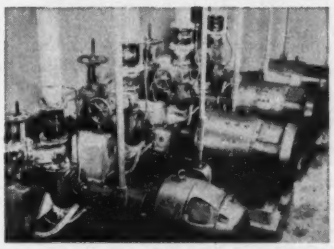
About eleven years ago Worthington specialists solved this problem of protecting pumps from stray current corrosion. As a result, Worthite pumps were installed in the manner illustrated above in the data sheet.

Today, after examination, there is practically no corrosion on the pumps. A life of 20 to 30 years is indicated for these Worthite pumps. Maintenance costs are a fraction of what they had been before. And the Worthite units required only 40 hp as compared to 75 hp for previously used (lead) pumps. They still deliver more electrolyte and have not fallen off in capacity after eleven years service.

During the same eleven years, copper and zinc refineries everywhere in the world have been specifying Worthite pumps for electrolyte circulation. Old refineries now modernize with them. Once again, Worthington's 111-year experience with pumping equipment helped to solve a tough problem for industry.

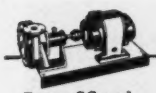
At Worthington, we'd like to hear about your pumping problems. Write Worthington Corporation, formerly Worthington Pump and Machinery Corporation, Centrifugal Pump Division, Harrison, N. J.

*Reg. U. S. Pat. Off.

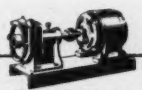


THIS ALLOY PUMP INSTALLATION FOR ELECTROLYTE CIRCULATION is comprised of these Worthite centrifugal pumps, 6-in. discharge by 8-in. suction. They circulate copper sulfate electrolyte and have been in service for eleven years without any indication of stray-electric-current corrosion. Note how pumps are insulated.

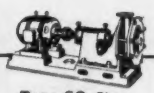
C.2.1



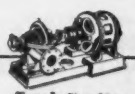
Types CG and CGL. Sizes ¾" to 10". Capacities to 6000 GPM; heads to 200 ft. Liquid ends of WORTHITE.



Type CF. Sizes 1" to 4". Capacities to 1000 GPM; heads to 130 ft. Standard, all iron and all bronze.



Type CQ. Sizes 1½" to 3". Capacities to 600 GPM; heads to 130 ft. at 1750 RPM. Closed impeller.



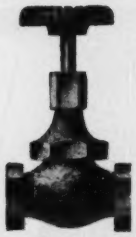
Type L. Sizes 3" to 8". Capacities to 2250 GPM; heads to 300 ft. Single stage volute. For general service.

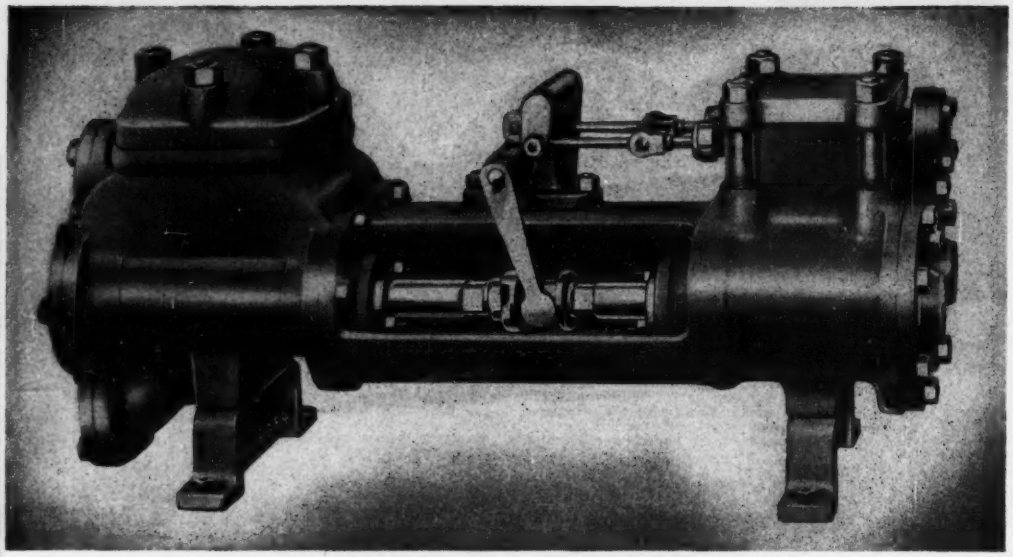
WORTHINGTON

Centrifugal Pumps

The World's Broadest Line Assures You the Right Pump for Every Job

This is a throttle valve





. . . And so is this!

You may think you're getting the most out of the steam in your plant—but here's an idea that's slipped by the best of them.

If your plant uses steam, you undoubtedly use throttle valves—and you undoubtedly use pumps. But have you ever considered using a pump that can do the two jobs more economically than one?

A steam pump can do just that—as a pump it pumps, and as a steam "consumer" it serves nicely as a throttle valve to reduce the pressure with only a small loss in heat energy. Big point is that it does all this on power that's otherwise wasted. THE POWER'S THERE, WHY NOT USE IT?

MODERN WORTHINGTON STEAM PUMPS OFFER YOU ALL THESE ADVANTAGES

THEY'RE FLEXIBLE because capacity can be easily varied. And exhaust steam can be used for process work or heating.

THEY'RE SIMPLE—any mechanic can operate or maintain one with ease. There's very little that can go wrong. No motors or couplings to maintain.

THEY'RE LONG-LIVED because they operate at slow speeds minimizing wear. Features: 250-pound steam end, lubricated drop forged valve gear, integral cast cradle.

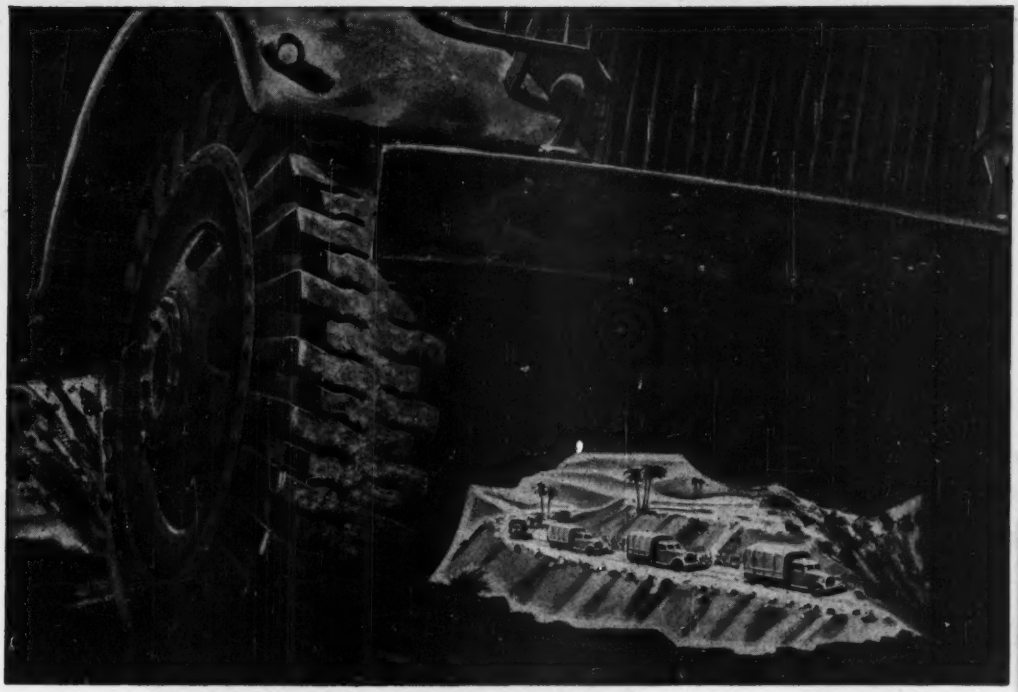
For seven reasons why Worthington steam pumps lead the field, write for Bulletin W111-B13B to Worthington Corporation, Reciprocating Pump Division, Harrison, N. J.

P-2.5

The World's Broadest Line Assures You the Right Pump for Every Job

WORTHINGTON

Steam Pumps



We help make 'em cold for hot service

At a Houston, Texas, plant operated by the Goodyear Synthetic Rubber Corporation for the R. F. C.'s Synthetic Rubber Division, it's *Worthington* equipment that helps maintain the required brine temperatures, ranging from 13 to 17 F, in the manufacture of "cold rubber".

Goodyear developments have done a lot to improve serviceability of cold rubber for tires, particularly for use on military vehicles.

The list of names that have joined them in selecting Worthington refrigeration includes: U. S. Rubber Co., Firestone Tire and Rubber Company, General Tire and Rubber Company, Minnesota Mining and Manufacturing Co., Ford Motor Company, General Aniline and Film Corp., North American Aviation Company, Celanese Corporation of America, Tidewater Oil Co., Rohm & Haas.

Investigate more worth with Worthington

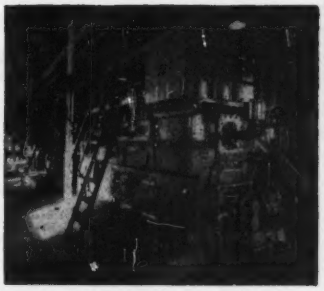
For air conditioning or refrigeration, call upon Worthington . . . you'll benefit from an unequalled experience serving industrial and commercial applications.

The complete line of Worthington refrigeration equipment includes vertical (1 to 150 tons), Y-type (150 to 450 tons) and horizontal ammonia compressors (50 to 1,000 tons); Freon compressors (3 to 125 tons); centrifugal compressors (to 2,600 tons); gas-engine compressors, chillers, exchangers, condensers, pumps and other auxiliary equipment.

No other manufacturer makes so complete a line. A Worthington system is all Worthington-*made*—not just Worthington-assembled—assuring you of perfectly balanced operation and unit responsibility.

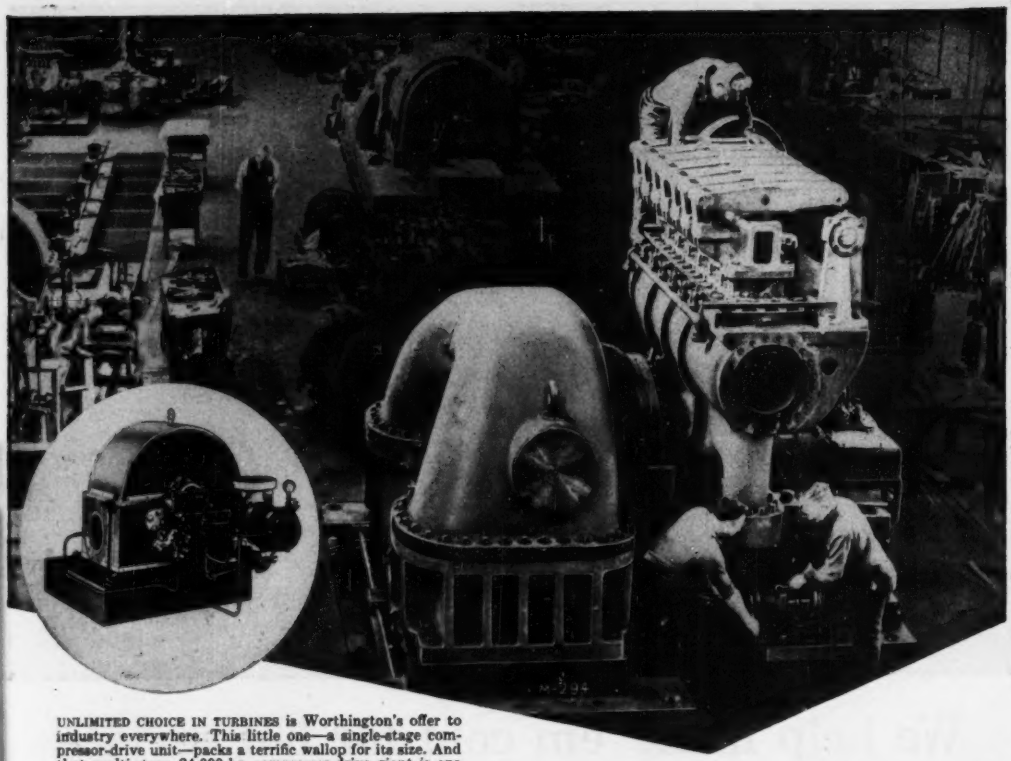
Consult your local Classified Telephone Directory for the Worthington distributor that is nearest you or write to Worthington Corporation, Air Conditioning and Refrigeration Division, Harrison, New Jersey.

*Reg. U. S. Pat. Off.



FOUR WORTHINGTON LTC-3 GAS ENGINE AMMONIA COMPRESSORS at Houston plant operated by Goodyear for the R. F. C.'s Synthetic Rubber Division. Units are rated 400 BHP at 320 rpm. They chill 24% calcium chloride brine down to desired 13 to 17 F range. Other Worthington equipment at the installation includes brine coolers, condensers and brine pumps.

*Reg. U. S. Pat. Off. A.2.12



UNLIMITED CHOICE IN TURBINES is Worthington's offer to industry everywhere. This little one—a single-stage compressor-drive unit—packs a terrific wallop for its size. And that multi-stage 24,000-hp compressor-drive giant is one of the largest ever built for this type of service.

Single-stage midgets to multi-stage giants

Whether your turbine requirements call for the biggest or the smallest—straight condensing . . . straight non-condensing . . . extraction . . . mixed pressure extraction . . . low pressure . . . high back pressure . . . for mechanical or generator drive . . . with governors for constant or variable speed—*Worthington has an answer.*

Each Worthington turbine is designed to make the steam do *more* work, so you save power and money throughout its long life.

Learn more about Worthington turbines. Get the facts on why *there's more worth in Worthington* by writing to Worthington Corporation, formerly Worthington Pump and Machinery Corporation, Steam Turbine Division, Wellsville, N. Y.

T-2.2

A GREAT TEAM IN STEAM

WORTHINGTON

Steam Turbines

Cut Your Resin Costs!

WE CAN SHOW YOU HOW WITH

Celanese* PARAFORMALDEHYDE

Now competitive with Formalin!

- **Shortens processing time...**
- **Gives higher yield, greater recovery... with your present equipment!**

Celanese Paraformaldehyde is now available in the largest volume ever—at a new low price that makes it better than competitive with formalin in most resins.

Virtually water-free (91% minimum assay), Celanese Paraformaldehyde supplies formaldehyde far more easily . . . reduces water-removal cycles . . . uses smaller, less equipment . . . shows better yields, less formaldehyde loss . . . greater phenol recovery.

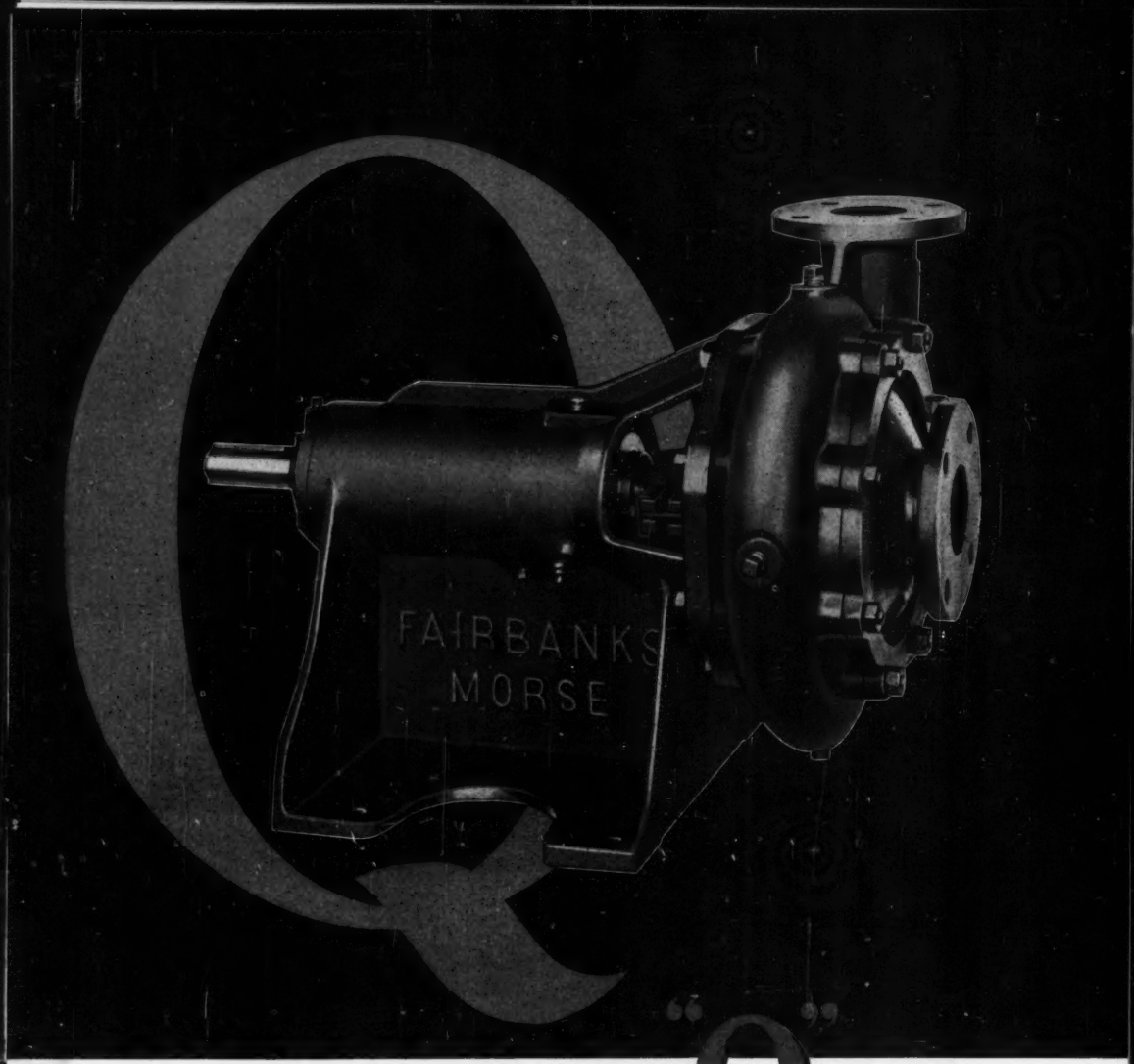
Let us work out formulations for your specific needs. If you do not have facilities or time for experiment, we will be glad to furnish extensive data based on our experience in the use of Paraformaldehyde in most phenol and urea resin formulations. A Celanese technical representative will work directly with you on your specific problems . . . and show you how Celanese Paraformaldehyde can save you money, effect important production shortcuts, and give you greater resin production. Write Celanese Corporation of America, Chemical Division, Dept. 553-G, 180 Madison Avenue, New York 16, N. Y.

• • •

Large stocks of Celanese Paraformaldehyde are maintained in major U. S. cities, for immediate shipment. Available in 50 lb. bags and 100 lb. and 300 lb. drums . . . flake, 200 mesh powder, and coarse powder.

Celanese® CHEMICALS

*Reg. U. S. Pat. Off.



it's Your "Q"

Quality . . . that costs no more is yours when you choose Fairbanks-Morse Side Suction Centrifugal Pumps. Extensive engineering laboratories . . . production line methods with precision machining of all parts enable Fairbanks-Morse to offer you a side suction centrifugal with the design, workmanship and performance normally obtained only in highest quality split-case pumps.

Open type, single suction, high efficiency impeller . . . ball-bearing frame construction for long life and smooth operation . . . one-piece, solid cast frame . . . close-grained smooth cast iron volute . . . are among the many big pump features you'll find in these moderate priced side suction centrifugals.

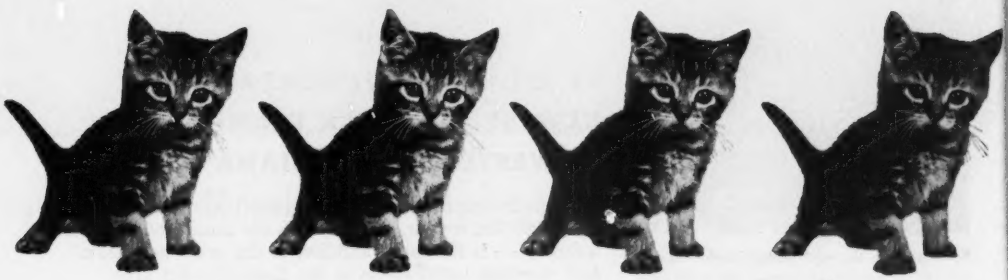
For a "cue" to better pump performance, choose the pumps that spell quality with a capital "Q" . . . Fairbanks-Morse Side Suction Centrifugals. Fairbanks, Morse & Co., 600 S. Michigan, Chicago 5, Ill.

FAIRBANKS-MORSE,

a name worth remembering when you want the best

PUMPS • DIESEL LOCOMOTIVES • ELECTRICAL MACHINERY • SCALES • HOME WATER SERVICE EQUIPMENT • RAIL CARS • FARM MACHINERY • MAGNETOS

What do kittens have in common with Barrett* Coal-Tar Chemicals?



Uniformity, of course. It's basic.

When you buy coal-tar chemicals, you need *uniformity* at a high level of quality.

When you buy from Barrett, you get uniform quality resulting from BARRETT'S BASIC POSITION IN RAW MATERIALS *and* NEARLY 100 YEARS OF COAL-TAR CHEMICAL RESEARCH AND DEVELOPMENT.

Barrett is Basic ...in your business

Barrett Coal-Tar Chemicals

Phenols
Cresols
Cresylic Acids
Xylenols
Pickling Inhibitors
Benzol
Toluol
Xylol
Naphthalene
Hi-Flash Solvent
Phthalic Anhydride
Dibutyl Phthalate
ELASTEX DCHP Plasticizer*
"ELASTEX" 10-P Plasticizer—(DIOP)
"ELASTEX" 50-B Plasticizer*
"ELASTEX" 28-P Plasticizer—(DOP)
Phenolic Resins
Niacin (Nicotinic Acid)
Pyridines
Picolines
Quinoline
Lutidines
Tar Acid Oils
Neutral Coal-tar Oils
Coal-tar Creosote
CUMAR Paracoumarone-Indene Resin*
Carbonex Rubber Compounding Hydrocarbon*
Bardol Rubber Compounding Oil*
Flotation Agents

Barrett®

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK 6, N. Y.

*Reg. U. S. Pat. Off.

In Canada: The Barrett Co., Ltd., 5551 St. Hubert St., Montreal, Que.

GRAVER BINS FOR CARBON BLACK

Equipped with the most modern processing machinery and centralized controls, this great plant of the Continental Oil Black Co. requires only 29 employees to produce annually 25,000,000 lbs. of high abrasion furnace black, which is marketed by the Witco Chemical Company to the rubber and paint industries. Utilizing gas, oil, process water and emergency steam from the nearby Continental Oil Refinery, the plant represents industrial planning of a high order and operating excellences of such a level that the highest quality products are produced.

A joint operation of the Continental Carbon Co. and the Continental Oil Co., this new plant of the Continental Oil Black Co. was engineered and built by United Engineers & Constructors Inc of Philadelphia.

AT WITCO - CONTINENTAL'S NEWEST OIL BLACK PLANT IN WESTLAKE, LOUISIANA

Now producing high abrasion furnace black at the rate of 25,000,000 lbs. a year, this plant — the most modern in the industry — is the latest addition to the great petroleum and chemical installations in the Lake Charles area.

For this plant, Graver supplied the tankage for the oil feed stocks to be processed and the bins to receive the finished product. The pair of Graver-built bins, of cone roof and cone bottom design, each measure 30′ in diameter by 38′ 4″ high with a total storage capacity of 1,500,000 lbs. of oil black.

In view of the high standards exercised by the Continental Oil Black Co. in the choice of equipment, Graver is pleased to have supplied the process tankage for this notable installation.

GRAVER TANK & MFG. CO., INC.

EAST CHICAGO, INDIANA

NEW YORK • CHICAGO • PHILADELPHIA • WASHINGTON • DETROIT
CINCINNATI • CATASAUQUA, PA. • HOUSTON • SAND SPRINGS, OKLA.

GRAVER

How these K&M insulations keep heat under power's "thumb"

THE PICTURE ABOVE, taken in a large Eastern power station, is good, but it can show only the "skin-deep" beauty of the Keasbey & Mattison Insulations on the feed water deaerator in the background and the duct in the right foreground. Under the glistening surfaces, finished tightly with K&M Insulating Cement, lies this interesting heat-keeping story.

On the feed water deaerator, the "defense in depth" against heat loss is provided by K&M Hy-Temp Blocks, 1½" thick, covered with "Featherweight" 85% Magnesia Blocks, 1½" thick... an ideal combination that makes the most of the high heat-resisting qualities of Hy-Temp and the high insulation value of "Featherweight" 85% Magnesia. Alone, "Featherweight" 85% Magnesia is good for temperatures up to 600° F. (on the duct shown it is more than sufficient); its combination with Hy-Temp provides efficient insulation from 600° to 1900° F.

These K&M Insulations are practical, economical, and durable. The insulating properties of "Featherweight" 85% Magnesia are not affected by alternate heating and cooling . . . by wetting and drying . . . and, being mineral in nature, will not burn. Both insulations are supplied in appropriate forms and thicknesses for all equipment surfaces and piping.

Your K&M distributor, who is an experienced applicator, will give you full information. Or write us direct.

Nature made Asbestos...

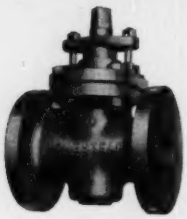
Keasbey & Mattison has made it serve mankind since 1873

KEASBEY & MATTISON

COMPANY • AMBLER • PENNSYLVANIA

WE MAKE *ALL* TYPES OF PLUG VALVES
. . . including the *right* one for *your* needs

HOMESTEAD CAM-SEALD



Straight-way—
Flanged or Screw Ends

Three-way—Screw or Flanged Ends

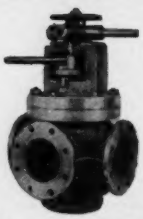
Four-way—Flanged or Screw Ends

HOMESTEAD CAM-SEALD, QUARTER-TURN PLUG VALVES
(non-lubricated, or pressure-gun lubricated, as desired)

Available in metals for most valve needs; for pressures to 3,000 lbs.; temperatures to 750° F.

HOMESTEAD LEVER-SEALD

Straight-way—
Flanged or Screw Ends



Three-way—Flanged or Screw Ends

Four-way—Flanged or Screw Ends

HOMESTEAD LEVER-SEALD, QUARTER-TURN PLUG VALVES
(non-lubricated, or pressure-gun lubricated, as desired)

Made in combinations of metals and alloys to meet practically any service requirement; from 1½" to 10"; from vacuum to 1,500 pounds.

HOMESTEAD-REISER

Straight-way—
Screw or Flanged Ends

Straight-way—
Worm & Gear Operated

Flow-Changer—Non-lubricated

HOMESTEAD-REISER SELF-SEALD LUBRICATED PLUG VALVES
(100% Port Area, or Venturi, as desired)

Available in semi-steel; cast steel; sizes ½" to 12" for steam pressures to 150 lbs.; oil-water-gas to 200 pounds.

We are the only manufacturer who makes *all* of the various types of plug valves used in industry . . . LUBRICATED . . . NON-LUBRICATED . . . FULL PORT . . . VENTURI. We have no "leaders." *We make them all;* therefore, we have no reason to "push" one type valve over another. Our only concern is to see that you get the *right* valve for *your* requirement.

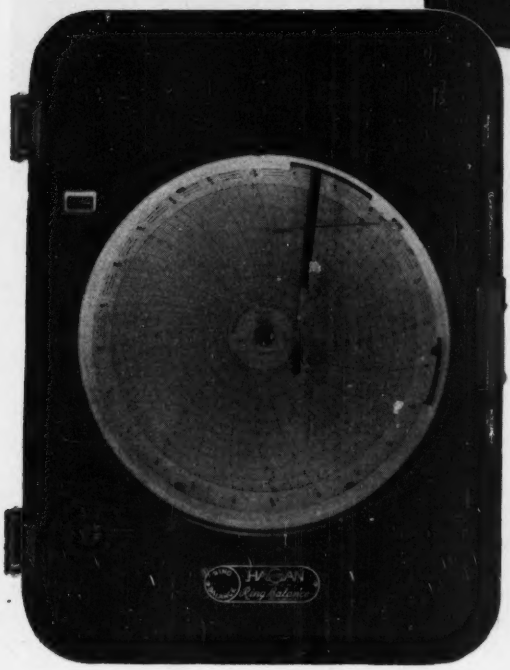
To help you keep this in mind the next time you need plug valves, we'd like to send you our catalog. Why not write for it today.

HOMESTEAD VALVE MANUFACTURING COMPANY
P. O. BOX 13 CORAOPOLIS, PA.

Serving since 1892

No stuffing box troubles in

HAGAN RING BALANCE METERS



because there are no stuffing boxes!

Forget about stuffing box troubles and pressure tight bearings when you install Hagan Ring Balance Meters. The simple, flexible S-tube connections to the ring assure dependable accuracy and trouble-free operation.

Features of the Hagan Ring Balance Meter include:

- **Calibration can be checked under operating conditions by check-weight method**
- **Excellent response at extremely low flow rates**
- **Mercury level not critical**
- **Full-scale chart differential is adjustable over a 7-to-1 range**

HAGAN CORPORATION

HAGAN BUILDING
PITTSBURGH 30, PENNSYLVANIA

Our engineers will be glad to show you how Hagan Ring Balance Meters can help solve your metering problems. Use the coupon, or write to Hagan Corporation, Hagan Building, Pittsburgh 30, Pa.

Hagan Corporation
Hagan Building • Pittsburgh 30, Pennsylvania

Please send me further information on Hagan Ring Balance Meters. I am particularly interested in .....

.....

NAME .....

POSITION .....

COMPANY .....

STREET AND NUMBER .....

CITY ..... ZONE ..... STATE .....

CE-7

International Salt Company's Industrial Engineers Will Show You How to

PROFIT BY THESE 4-WAY SALT SAVINGS

1. SAVINGS ON STORAGE by engineering the most efficient and compact salt storage system to fit your situation.

2. SAVINGS IN LABOR by reducing effort and supervision involved in salt or brine handling.

3. SAVINGS ON WASTE through accurate salt measurement and elimination of spillage and spoilage.

4. SAVINGS IN USE. Research and field work with hundreds of industries in many fields equip International to show you how best to utilize salt in your product processing—and for product improvement, too.

If your company uses salt, it will pay you to call on International Salt Company's Industrial Division.

Without obligation to you, this experienced staff of experts is at your service to inform you on latest salt developments in your field and to help on all phases of salt handling and storage, brine making, and salt and brine uses. They can help you save money four ways—and, on the record, the savings can be substantial.

A Complete Service

International Salt Company's Industrial Division is maintained as a service to industry by one of America's foremost salt producers.

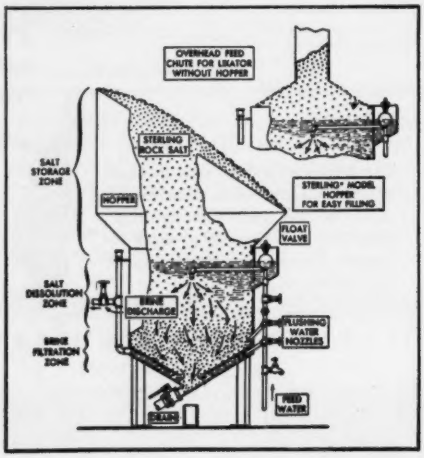
This company produces all types of salt and operates from strategically located mines and refineries. The scope of its operation necessitates familiarity with latest salt developments in every field, many of which have been pioneered by International Salt Company.

LIXATOR*—A NOTABLE EXAMPLE

The Lixator is one of International's outstanding advances in salt technology. Utilizing Sterling Rock Salt, the Lixate principle of self-filtration, invented and developed exclusively by the International Salt Company, provides a steady flow of pure, clean, fully saturated brine.

No handling or attention is required beyond the hopper-loading stage—gravity does all the work. The Lixate Process is adaptable to almost numberless industrial requirements, large or small.

*Reg. U. S. Pat. Off.



INTERNATIONAL SALT COMPANY, INC.

Scranton 2, Pa.

SALES OFFICES: Atlanta, Ga. • New Orleans, La.
Boston, Mass. • St. Louis, Mo. • Newark, N. J.
Buffalo, N. Y. • New York, N. Y. • Cincinnati, O.
Philadelphia, Pa. • Pittsburgh, Pa. • Richmond, Va.

BE SURE OF UNIFORM
HIGH QUALITY — SPECIFY

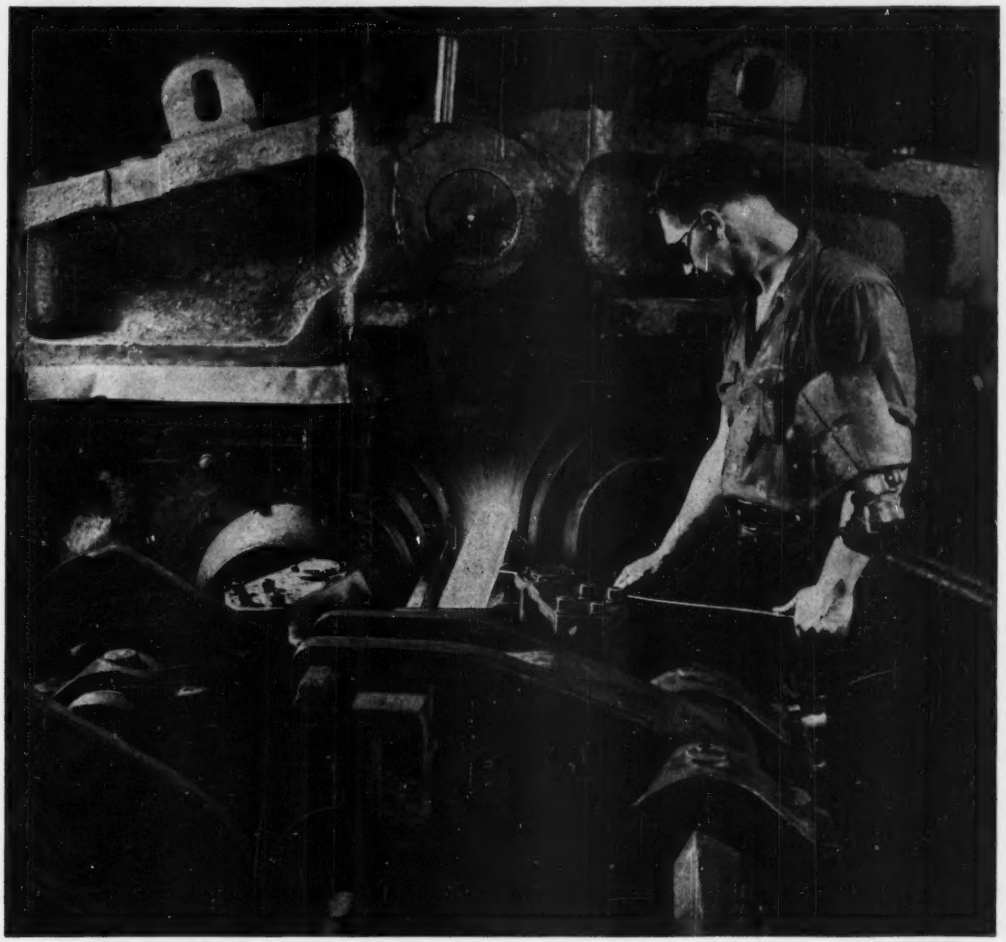
GLOBE
STEEL TUBES

...PRODUCT OF A LEADING
AND SPECIALIZED PRODUCER

From the massive mill that pierces the white-hot billet, through every step in processing, to final checks and tests in the laboratory, Globe processes are *specialized* . . . specialized to give you high quality — uniformity of diameter, concentricity, wall thickness.

Globe has *specialized* in the research, engineering, and manufacture of steel tubes for more than 30 years. Advanced machinery and methods — rigid inspection and quality controls — characterize all production operations from billet to finished tube. Write for the Globe general catalog.

GLOBE STEEL TUBES CO., Milwaukee 46, Wisconsin
Chicago • Cleveland • Detroit • New York • Houston • St. Louis
Denver • San Francisco • Glendale, Cal. • Philadelphia
Producers of Globe seamless stainless steel tubes — Gloweld welded stainless steel tubes — alloy — carbon — seamless steel tubes — Globe-iron seamless high purity ingot iron tubes — Globe Welding Fittings.



Globe Steel Tubes Are Available In:

- STAINLESS STEELS — GLOBE SEAMLESS
- STAINLESS STEELS GLOWELD WELDED
- ALLOY STEELS
- CARBON STEELS
- STANDARD AND SPECIAL ANALYSIS STEELS
- HIGH PURITY IRON — GLOBEIRON
- CORROSION RESISTANT STEELS
- HIGH-TEMPERATURE SERVICE STEELS
- MECHANICAL AND PRESSURE TUBING

GLOBE TUBES

You'll save time and trouble on H.P. VESSEL GASKETS

...when J-M Goetze gasket specialists make them for you

When you need gaskets such as those above, which were made for pressure vessel service over 5000 psi, consider this. It takes less time and trouble to turn the job over to J-M Goetze —an organization that has specialized in gasket design and manufacture for 67 years. And it usually costs less in the long run.

Goetze engineers can select the right style for maximum sealing efficiency. They know the correct metals and other factors required for efficient, long-lasting gaskets.

Goetze Gaskets are made exactly to the last detail of your specifications and conditions. They are made to craftsmen's perfection . . . with modern machine tools, some of which were specially designed by Goetze for gasket manufacture.

If you need gaskets for high pressure vessels or similar applications, send us a drawing or template for quotation. Or write for further information to Johns-Manville, Box 60, New York 16, New York.

Johns-Manville *Goetze* GASKETS

THERE'S A JOHNS-MANVILLE PACKING AND GASKET FOR EVERY SERVICE

TEST PUMPING

tells an interesting story

The outstanding features of Layne constructed wells and pumps are pictured and described in a catalog entitled "Layne Well Water Systems." A copy will be sent on request.

"Test Pumping"—is the trial run, shake-down cruise—or field maneuver of every well constructed by Layne. It is these tests that show what skill and experience have accomplished.

But long before the test pumping can be made, Layne has had to do a lot of planning, plotting and figuring out of such things as; kind of sand screen, size of drive shaft, type of bearings, number of pump stages and how much horsepower the motors should have to produce a promised amount of water against a certain pressure.

Once all of the above answers are on paper, they must be transmitted into an underground construction project—a task that requires more than ordinary skill and ability.

But wherever water is needed in quantity and at low cost, you may be sure that units installed by Layne will have unmatched efficiency, operate with utmost smoothness, be ever dependable and capable of lasting many, many years.

For further information on any phase of water development, address

LAYNE & BOWLER, INC.
General Offices, Memphis 8, Tenn.

Layne
WATER WELLS
VERTICAL TURBINE PUMPS
WATER TREATMENT

An Outstanding Record of Acceptance!

LESLIE Floatless Level Control installation on five 85-90000 kw generators, maintaining the hotwell level ±1" by controlling 6" valve in condensate pump discharge—in service 12 months—led to 16 more installations for same company.

The above is typical of the fast growing acceptance of this rugged and accurate level control.

ADVANTAGES

- EASY TO INSTALL
- ACCURATE REGULATION (±1" Water Column)
- NO FLOATS, STUFFING BOXES, ETC.
- MULTI-MEDIUM ACTUATED
- DIAPHRAGM PRESSURE ELEMENT
- ACTION REVERSIBLE

Applications: On open and pressurized vessels, including boilers, tanks, evaporators, heaters, standpipes, etc.

PRINTED IN U.S.A.

***SEND** for illustrated Bulletin*

Look for LESLIE Regulators under "Valves" or "Regulators" in your Classified Telephone Directory in leading industrial cities where LESLIE factory-trained engineers are located.

LESLIE CO., 279 Grant Avenue, Lyndhurst, New Jersey

1627

PRESSURE REDUCING VALVES • PRESSURE CONTROLLERS • FLOATLESS LEVEL CONTROLS
PUMP GOVERNORS • TEMPERATURE REGULATORS
SELF CLEANING STRAINERS • AIR HORNS • STEAM WHISTLES

PUT UP TO STAY UP!

That's the statement of a large eastern chemical plant. Their letter to us continues: "We have found that cast iron construction stands up very well against the corrosive fumes of $HC\ell$, $C\ell_2$, etc. . . . the unit heaters that have copper tubes give trouble due to corrosion in a few years . . . we consider GRID Unit Heaters satisfactory and would certainly recommend them for installation where corrosive acid fumes exist". Such service record occurs because GRID is completely different from other unit heaters — here's how:

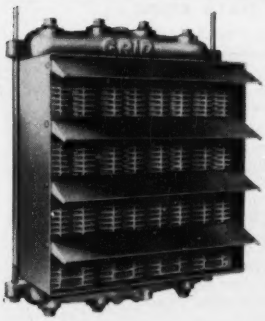
GRID is an all cast unit with finned heating sections and headers tested to withstand steam pressures up to 250# P.S.I.

GRID construction uses no brazed, soldered, rolled or welded connections between condenser and headers. A specially designed threaded nipple assures a precision, leakproof fit.

GRID construction has all similar metals in contact with steam thus preventing electrolytic corrosion which eventually occurs in copper type unit heaters where steam passes from iron pipes into copper cores. (Write for booklet CORROSION IN UNIT HEATERS).

GRID construction resists corrosion from corrosive acid fumes that exist in chemical plants.

GRID design incorporating low outlet temperatures, proper fan sizes and motor speeds, assures delivery of warm comfortable air in ample volume to the working level. No stratification of warm air at the ceiling to waste your fuel dollars.



GRID BLAST COILS ARE IDEAL FOR MANY USES THROUGHOUT CHEMICAL PROCESSING INDUSTRIES — WRITE FOR CATALOG BC-1049.

These are the reasons why users of GRID Unit Heaters get 16 years and more of trouble-free service. There are units cheaper than GRID, but there are none better.
You start saving money the day you install GRID Unit Heaters.

REPRESENTATIVES IN PRINCIPAL CITIES

D. J. MURRAY MANUFACTURING CO.
MANUFACTURERS SINCE 1883
WAUSAU, WISCONSIN

What do you do when it takes hours... sometimes days... to change v-belts?

1 **Put one or several maintenance men on the job**

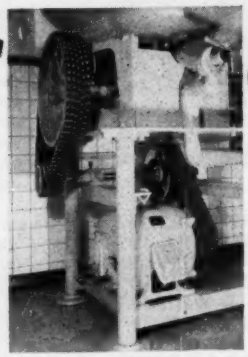
...and pay for repairs while production stands still

2 **Pay overtime**

...and have repair costs eat away your profits

3 **Standardize on VEELOS...**

...and change belts in up to 1/10th the time
...save labor, save time and save overtime
...keep machines producing for maximum profit



Comparison proves the value of VEELOS...

Minimum Inventory—4 reels of Veelos in the O, A, B and C widths can replace up to 316 different sizes of endless v-belts. If you use only one width of v-belt you can stock just one reel of Veelos.

Quick Installation—link construction makes it unnecessary to remove outboard bearings.

Complete Adjustability—vibrationless, full power delivery is assured because uniform tension on each belt in a matched set can be maintained.

VEELOS
THE LINK
V-BELT

VEELOS DATA BOOK

gives complete details on construction, installation and uses. We'll gladly send you a free copy of this 28-page fact-full book... write today.

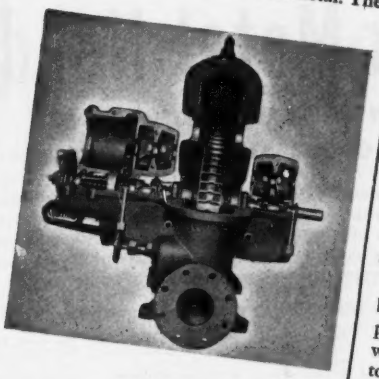
MANHEIM MANUFACTURING & BELTING COMPANY
602 Manbel St., Manheim, Pa.

ADJUSTABLE TO ANY LENGTH · ADAPTABLE TO ANY DRIVE

Made in all widths in three types: regular, oil-proof, static conducting. Also in double V in O, A and B. Packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. VEELOS is known as VEELINK outside the United States.

TERRY

The rotor of a Terry Solid-wheel Turbine is a single forging of special composition steel. It is first rough turned in two operations, as illustrated, and then two cuts are taken to mill the semi-circular buckets from the solid metal. The wheel at the top has been finished, ready for mounting on the shaft. *The result is a single-piece wheel with no parts to loosen or work out.*



As the only function of the blades is to form a series of pockets, wear of the blades is of little consequence and does not materially affect the horsepower or efficiency. The important part of the bucket is the back, or bottom, which is a solid forging.

It is impossible for the blades to foul. They have large clearances, and are further protected by the projecting rims at the sides of the wheel. As the side clearances are also very large, end play can do no harm.

The Terry Solid-wheel Turbine is an extremely reliable piece of equipment. Why not write for complete details today?

THE TERRY STEAM TURBINE CO.

TERRY SQUARE, HARTFORD 1, CONN.

77-1188

Memo

Send for a copy of bulletin S-116 which describes the many advantages of the Terry Solid-wheel Turbine.

One Call for Your Metal Needs!

SAVE TIME AND TROUBLE WITH ONE-CALL BUYING FROM COMPLETE WAREHOUSE STOCKS OF ALL AVAILABLE METALS

Give yourself and your company the full benefit and big convenience of *"one-stop"* buying of metals from Metal Goods Corporation. You'll simplify metals purchasing a lot by calling on our nearest representative. You can rely on us to supply your requirements correctly, completely and quickly. We maintain seven well stocked warehouses and eleven sales service offices to serve your needs. Many metals users are making very profitable use of Metal Goods Corporation service. May we help you?

Please call, wire, or write the following Metal Goods Corporation representative nearest you.

OFFICES AND WAREHOUSES

St. Louis 15, Missouri
5239 Brown Avenue
Nelson L. Hower
Phone: GOodfellow 1234

Kansas City 16, Mo.
1300 Burlington
Frank D. Hogan
Phone: NOrday 3516

Tulsa 3, Oklahoma
302 North Boston
Scott J. Harrison
Phone: 4-1175

Houston 3, Texas
711 Milby Street
Harris T. Gregg
Phone: CEntral 8881

Denver 2, Colorado
2425 Walnut Street
Neal Dehn
Phone: AComa 5891

Dallas 9, Texas
6211 Cedar Springs Rd.
Sam D. Hodgdon
Phone: ELmhurst 3271

New Orleans 12, La.
432 Julia Street
Carl T. Wedemeyer
Phone: CAnal 7373

SALES SERVICE OFFICES

Wichita, Kansas
2200 East Central
Ray Haller
Phone: 7-8921

Jackson, Mississippi
781 Raymond Road
George E. Akerberg
Phone: 5-2711

Decatur, Illinois
1305 West Sunset
Arlie W. Tempel
Phone: 8-1314

Baton Rouge, Louisiana
4419 Mimosa Street
Paul P. Vidovic
Phone: 4-4738

Indianapolis 2, Ind.
1333 N. Pennsylvania
Harry L. Newton
Phone: Lincoln 4980

Memphis, Tennessee
713 Columbian Mutal Tower Bldg.
Robert W. Downs
Phone: 5-8721

Omaha, Nebraska
3515 No. 67th Avenue
C. M. Cooley
Phone: Walnut 1112

Beaumont, Texas
238 Bowie Bldg.
Lee T. Dodson
Phone: 4-7536, 4-7537

Fort Worth, Texas
3821 Carolyn
John M. Turbitt
Phone: FOrtune 4369

San Antonio, Texas
2012 Alamo Natl. Bldg.
Roy D. Bagaley
Phone: GArfield 3161

Davenport, Iowa
924 State Street
Robert L. Tharp
Phone: 2-3156

METAL GOODS CORPORATION

GENERAL OFFICES: ST. LOUIS 15, MISSOURI

It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs. pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods. Data on these pumps sent immediately on request

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

Saves floor space.

Desired delivery temperature automatically maintained.

Slugs of liquid entering pump will do no harm.

75 pounds in a single stage.

NASH ENGINEERING COMPANY

313 WILSON, SO. NORWALK, CONN.

8 BOURDON TUBE MATERIALS

MAKE IT EASY TO SELECT THE RIGHT ASHCROFT DURAGAUGE FOR YOUR PARTICULAR NEEDS

- **Phosphor Bronze**
- **S.A.E. 4130X Alloy Steel**
- **S.A.E. 4650 Alloy Steel**
- **"K" Monel**
- **Type 316 Stainless Steel**
- **Type 347 Stainless Steel**
- **Type 431 Stainless Steel**
- **Beryllium Copper**

Service conditions and requirements determine what Bourdon Tube material is best in the pressure gauges you buy. To insure sustained accuracy and maximum durability in specific installations, Ashcroft Duragauges are available with Bourdon Tubes *in any one of the 8 listed materials.*

All Bourdon Tubes used in Ashcroft Duragauges are extra-wide–have greater sensitivity to slight pressure change. Pulsating pressures 50% higher than the tube rating remove any possibility of tube "set", and all tube joints are stress relieved after assembly. You can select with complete confidence that your Duragauges will serve accurately under the working pressures and corrosive conditions common to your operations.

Ashcroft Duragauges have other features important to you. The Nylon Movement* outwears all others. Unusually long tip travel assures greater accuracy of indication. The micrometer adjustment pointer can be reset while on the shaft. Precise recalibration of gauges in the field is easy. Sturdy lifetime cases, in a choice of materials, are available for stem, wall or flush mounting.

The nearby Ashcroft Distributor will gladly help you choose the right Duragauges for your particular service.

*Patented

ASHCROFT GAUGES

A product of **MANNING, MAXWELL & MOORE, INC.** STRATFORD, CONNECTICUT

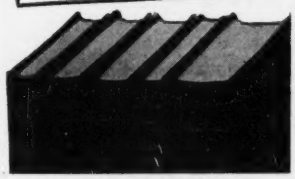
MAKERS OF 'ASHCROFT' GAUGES, 'HANCOCK' VALVES, 'CONSOLIDATED' SAFETY AND RELIEF VALVES, 'AMERICAN' INDUSTRIAL INSTRUMENTS. BUILDERS OF "SHAW-BOX" CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES.

McGRAW-HILL BOOKS *for the Chemical Engineer*

The National Nuclear Energy Series

. . . published by McGraw-Hill under a contract with Columbia University, affords scientists and the public a compilation of atomic research reports on work carried out as part of the U.S. Atomic Energy Program. As such, it includes much of the information for which industry and science have been waiting, covering a wealth of data from the many laboratories and scientists associated with the project.

8. **RADIOCHEMICAL STUDIES The Fission Products**
By Coryell and Sugarman. Three parts, not sold separately. 2086 pp., illus., $18.50
9. **The CHEMISTRY of URANIUM, Part I, The Element, Its Binary and Related Compounds**
By Katz and Rabinowitz. 609 pp., illus., $7.25
10. **Preparation, Properties, and Technology of FLUORINE and ORGANIC FLUORO COMPOUNDS**
By Slesser and Schram. 868 pp., illus., $10.50
11. **Physical Properties of HEAVY WATER**
By Kirshenbaum, Murphy, and Urey. 456 pp., illus., $5.25
12. **Miscellaneous PHYSICAL and CHEMICAL TECHNIQUES of the Los Alamos Project**
By Graves and Froman. 336 pp., illus., $4.00



13. McGraw-Hill CHEMICAL PLANT LIBRARY

5 volumes • 2359 pages • 975 illustrations
JAMES A. LEE, Consulting Editor
Prepared by a Staff of Experts

USE this set of data-packed McGraw-Hill books as a real time-and-work-saving tool . . . as an up-to-date library of management, engineering, and operating facts that can help you quickly solve everyday problems. Here are thousands of clear, concise pointers on chemical calculations, economics, unit operations, industrial chemistry, and materials of construction. The fundamentals, methods, and data these books present are accurate, thorough, complete. The Library is the result of years of experience with chemical plant problems, *and the man who has it has the best.*

INCLUDES:

- **Shreve's** Selected Process Industries
- **Pierce's** Chemical Engineering for Production Supervision
- **Lee's** Materials of Construction for Chemical Process Industries
- **Clarke's** Manual for Process Engineering Calculations
- **Tyler's** Chemical Engineering Economics

See coupon for money-saving offer

1. CHEMICAL ENGINEERS' HANDBOOK

Prepared by a Staff of Specialists

JOHN H. PERRY, Editor
E. I. du Pont de Nemours & Co.

1942 pages, 2057 illus., graphs, tables, $17.00

THE 3rd edition of this great chemical engineering work brings you a fresh coverage of both standard and recently compiled facts, figures, and methods applicable not only to chemical engineering but to fields related to the industry. Details of developments in every branch of chemical engineering are expertly presented by more than 140 recognized authorities. A wealth of material includes technical data on general theory of diffusional operations, furnaces and kilns, size enlargement, azeotropic distillation, and many other topics.

(See coupon for easy terms)

3rd Edition
World's standard reference on chemical engineering fundamentals and practice

Have you seen these recent publications?

2. UNIT PROCESSES IN ORGANIC SYNTHESIS

Covers the principles and practices of reactions in organic synthesis, recording their development in terms of underlying unit processes. Deals with nitration, amination by reduction, halogenation, sulfonation, oxidation, hydrolysis, etc.—systematically discussing the factors and fundamental principles concerned in each. Fully revised to keep pace with chemical and chemical engineering advances, the book gives increased attention to developments in kinetics and thermodynamics.

Ed.-in-Chief, P. H. Groggins, Bu. of Agric. & Ind. Chem., U. S. Dept. of Agric., Wash., D. C. 4th Ed., 937 pp., over 200 illus. and tables, $12.50

3. ABSORPTION and EXTRACTION

Outlines the underlying theory of such important diffusional processes of the unit operations of chemical engineering as absorption, extraction, drying, humidification, and dehumidification. Particular attention is given to the engineering problems connected with the design and operation of equipment for absorption and extraction. The book gives special attention to mass transfer between phases, covering theory, design procedures, and performance data in this field.

By T. K. Sherwood, Dean of Engr., M.I.T., and R. L. Pigford, Chairman, Dept. of Chem. Engr., Univ. of Del. 2nd Ed., 478 pp., 214 illus, $7.50

4. CORROSION: Causes and Prevention

Simple, easy-to-understand explanation of the mechanism of corrosion and practical methods of prevention. Explains how corrosion prevention cuts waste—kinds of corrosion, their nature and occurrence—how to prevent corrosion in various engineering fields—economic aspects of corrosion prevention. Third edition includes sections on Biological Influence and Cathodic Protection, and advances in practical preventives.

By Frank N. Speller, Corrosion Consultant. 3rd Ed., 664 pp., illus. $10.00

5. FUNDAMENTALS OF ATOMIC PHYSICS

Designed to be as simple as possible, this book gives engineers a groundwork in atomic and nuclear fundamentals. Covers high-voltage particle accelerators, the kinetic theory of gases, charge and mass of electron, electronics, photoelectric effects, X-rays, the Bohr theory of the origin of spectral lines, electron configuration in atoms. Treats matter waves, isotopes, and other important factors.

By Saul Dushman, Research Consultant, Gen. Elec. Co. 294 pages, illus., $5.50

6. ENERGY SOURCES —The Wealth of the World

A thorough census of our energy sources—past, present, and future. Tells how long existing fuel supplies may last—and what we can do against the day they are exhausted. Evaluates oil, coal, oil-shale, peat, and tar-sand reserve figures. Analyzes efficiencies of energy consuming devices and conversion processes. Weighs energy losses in production, mining, transportation, etc. Explains energy values of the earth, and includes a thought-provoking Energy Balance Sheet.

By Eugene Ayres, Gulf Res. & Devel. Co., and Charles A. Scarlott, Ed., Westinghouse Eng'r. 344 pp., 114 illus., over 60 tables, $5.00

7. INDUSTRIAL PIPING

Brings together in a single volume a vast store of essential information on industrial piping—showing what materials and what kind of pipe and fitting should be used, and where. Information on each service—water, gas, steam, etc.—given in a separate chapter; data includes pertinent methods of flow calculations; the most commonly used materials, fittings and valves; methods for determining pipe sizes and pressure drops; data on estimating piping costs.

By Charles T. Littleton, Formerly Engineer in Charge of Piping, American Cyanamid Co. 3rd Ed., 394 pp., 170 illus., 239 tables. $8.00

10 DAYS' FREE EXAMINATION

McGraw-Hill Book Co., Inc. 330 W. 42 St., NYC 36

Send me book(s) checked below for 10 days' examination on approval. In 10 days I will remit for book(s) I keep plus few cents for delivery, and return unwanted book(s) postpaid. (We pay for delivery if you remit with coupon; same return privilege.

☐ 1. ($5.00 in 10 days, then $4.00 a month to total $17.00)
☐ 2. ☐ 3. ☐ 4. ☐ 5.
☐ 6. ☐ 7. ☐ 8. ☐ 9.
☐ 10. ☐ 11. ☐ 12.

(Print)
Name.....
Address.....
City..... Zone.....
State.....
Company.....
Position CE-7-52

This offer applies to U. S. only

SPECIAL OFFER SAVE $4.00

Send me the McGRAW-HILL CHEMICAL PLANT LIBRARY, 5 volumes, for 10 days' examination on approval. If the books prove satisfactory, I will remit $3.50 in 10 days and $4.00 monthly until $27.50 is paid. Otherwise I will return books postpaid. This is a saving of $4.00 over the cost of the books if bought separately.

☐ 13.

Get

something extra

when you buy

lead sheet

When you place an order for lead sheet, chances are you state quantity, composition, size and weight, and that's all.

When you buy from National, you not only get sheet that meets these four specifications but you also get certain "extras"—extras characteristic of the *high quality* lead sheet made by the leader in lead.

Such as

(1) The grade of lead acknowledged best for acid-handling—St. Joe Chemical Lead.

(2) A smooth, even finish.

(3) A surface as free of flaws as careful milling can make it.

(4) Uniform over-all gauge.

(5) Maximum structural strength throughout.

These extras contribute to adaptability, workability, and durability – whether the sheet is used for handling corrosives, for architectural installations, or for radiation barriers.

It is these extra qualities, not specifically stated in your order, that give National Lead sheet its dependability on the job.

That's why we say—when you want lead sheet—come to National. And get something extra.

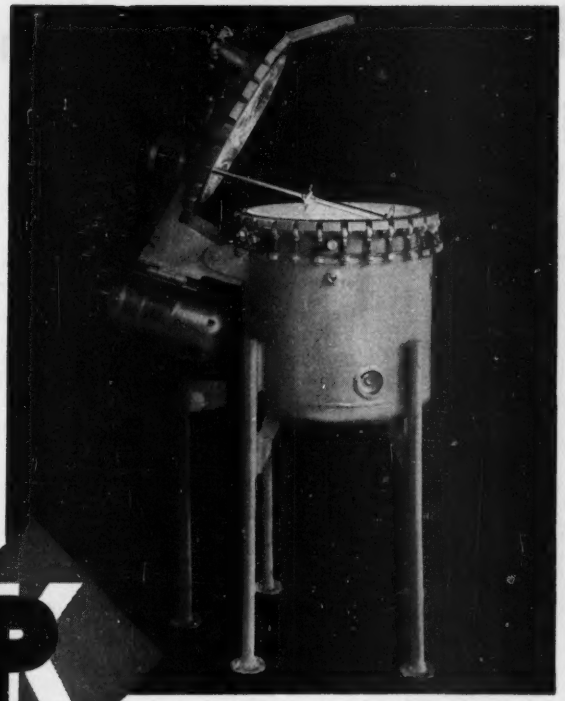
Sheet Lead

with a NATIONAL reputation

LEAD COMPANY

New York 6; Atlanta; Baltimore 3; Buffalo 3; Chicago 8; Cincinnati 3; Cleveland 13; Dallas 2; Philadelphia 25; Pittsburgh 12; St. Louis 1; New England: National Lead Co. of Mass., Boston 6; Pacific Coast: Morris P. Kirk & Son, Inc., Los Angeles 23, Emeryville 8 (Calif.), Portland 10, Seattle 4; Canada: Canada Metal Co., Ltd., Toronto 8, Montreal, Winnipeg, Vancouver.

*Reg. U. S. Pat. Off.



COOKED UP THIS COOKER . . .
WHAT CAN WE COOK UP FOR YOU?

p-k will design and make any tailored or standard pressure cooker or any similar piece of process equipment to your exact specifications.

The pressure cooker shown is typical of **p-k** designing and manufacturing ability to meet specific requirements for specific processing operations. It is a stainless steel jacketed unit, with No. 4 polish inside, designed for 50 lb. pressure on both sides to meet ASME standards. The cover with an integral double-propeller agitator, is counter-balanced for easy cleaning and loading.

No matter whether your present needs are for a kettle, agitator, or any type of pressure vessel, **p-k** will work out an answer for you. Write **p-k** today—for specific design assistance or for more complete information.

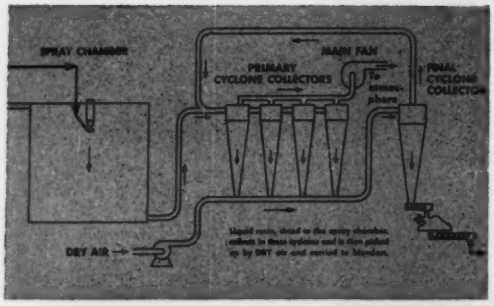
Mixers • Coolers • Kettles • Agitators
Nitrators • Reboilers • Autoclaves
Condensers • Evaporators • Sulfonators
Brine Heaters • Brine Coolers
Freon Coolers • Soap Crutchers
Ribbon Blenders • Fuel Oil Heaters
Vapor Condensers • Lube Oil Coolers • Lube Oil Heaters • Reaction Vessels • Instantaneous Heaters
Quenching Oil Coolers • Storage Heaters
Refrigerant Condensers • Twin Shell Blenders*
*Patented

the Patterson-Kelley Co., Inc.
170 Lackawanna Ave. East Stroudsburg, Penna.

1701

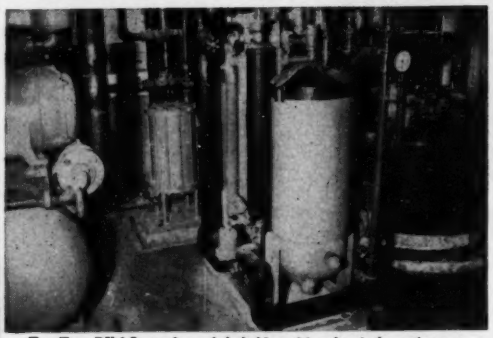
101 Park Avenue, New York 17 • Railway Exchange Building, Chicago 4 • 1700 Walnut Street, Philadelphia 3 • 96-A Huntington Avenue, Boston 16 • and other principal cities

LECTRODRYERS are production tools at these American *Cyanamid* Plants



DRY air picks up powdered resin to keep it DRY at American Cyanamid's Wallingford, Conn. plant

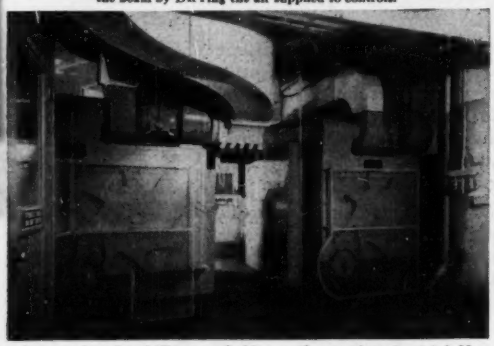
Get molding powders DRY and keep them that way; that's the function of this portion of the production line in this ultramodern plant. There's no moisture in the air that picks up molding powders as they come from the cyclones—no moisture to impair the quality American Cyanamid has compounded into these products.



Two Type BY-1 Lectrodryers help hold sensitive chemical reactions on the beam by DRYing the air supplied to controls.

On instrument air at Calco Chemical Division, Willow Island, W. Va.

No moisture gets into air lines here to condense, form ice, rust or sludge and cause trouble. Two Lectrodryers* designed especially for instrument air work, catch the vaporous moisture which aftercoolers, filters and separators let by. Calco Chemical Division's products are consistently higher in quality, therefore.



Aureomycin and penicillin are packed in a sterile area where the air is held at 6% relative humidity by these Lectrodryers.

Holding humidities constant at Lederle Laboratories Div., Pearl River, New York

Control the quality of air surrounding processes, just as you control materials going into products; this is a rule for quality production at Lederle Laboratories Division, as at the other divisions of American Cyanamid Company. Besides sterilizing the air here, Lectrodryers hold it at a constant temperature and humidity.

You probably have plenty of places where Lectrodryers will help you boost quality and speed production. For help in finding out, write Pittsburgh Lectrodryer Corporation, 303 32nd Street, Pittsburgh 30, Pennsylvania.

LECTRODRYERS DRY WITH ACTIVATED ALUMINAS

LECTRODRYER

*REGISTERED TRADEMARK U. S. PAT. OFF.

The new "Ozamatic"—compact, large-volume copying machine manufactured by Ozalid Division of General Aniline and Film Corporation, Johnson City, N. Y.

Stainless steel developing tank used in the "Ozamatic."

How ENDURO Develops a *Triple* Advantage for Ozalid

● At the heart of every Ozalid copying machine is a stainless steel developing tank. An endless rubber belt carries exposed Ozalid material over the perforated face of the tank. Ammonia vapors—generated inside the tank—pass through the perforations and develop the image. In a matter of seconds, businessmen get accurate duplicates of all kinds of paperwork. Each is dry and ready for immediate use.

Ozalid reports three definite advantages from their use of ENDURO Stainless Steel for many of these tanks: (1) Ease of fabrication, including drawing, forming, perforating; (2) Smooth, non-abrasive surfaces that require no finishing; and (3) Excellent corrosive resistance.

What tough jobs have you for Republic ENDURO Stainless Steel?—the metal that stubbornly resists rust and corrosion, and the action of most acids and alkalies . . . that is superbly easy to clean and to keep clean . . . that resists heat and offers good dimensional stability . . . that requires little or no maintenance . . . and that makes chemical process equipment *last long*. You just furnish the problem, either in process or product; Republic metallurgists will help you apply the proper analysis of ENDURO Stainless and Heat-Resisting Steel to overcome it. Write:

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

NOW ..see and hear "THE STORY OF STAINLESS"

FULL COLOR 16-MM SOUND FILM
27 minutes running time

The dramatic story of the discovery of stainless steel . . . how early production problems were solved . . . how the lustrous long-lasting metal grew to its present-day importance. Republic Steel's new film is now available for showing to qualified groups, without charge. Requires 16-mm. sound projector. Send name of organization or group, type of projector, requested date, to: Ideal Pictures Corp., 65 East So. Water St., Chicago 1, Ill.: or write Republic Steel, Dept. K, Cleveland 1, Ohio.

REPUBLIC STEEL

ENDURO STAINLESS STEEL

Other Republic Products include Carbon and Alloy Steels—Pipe, Sheets, Bolts and Nuts, Tin Plate, Tubing, Niles Barrels and Drums

Jenkins Bros. salutes CHEMICAL ENGINEERING on their 50th Anniversary

A FAIR OFFER

If you will put a Jenkins Valve, recommended for your particular service, on the worst place you can find — where you cannot keep other valves tight — and if it is not perfectly tight or it does not hold steam, oil, acids, water or other fluids longer than any other valve, you may return it and your money will be refunded.

Jenkins Bros

A FAIR OFFER THAT HAS BEEN IN EFFECT SINCE 1869

JENKINS VALVES

LOOK FOR THE DIAMOND MARK

SINCE 1864 TRADE JENKINS MARK

Jenkins Bros

BRONZE • IRON • STEEL • STAINLESS STEEL

This famous "Fair Offer" first appeared 33 years before CHEMICAL ENGINEERING began publication. It has been published at frequent intervals ever since. It can be repeated, again and again, only because all Jenkins Valves measure up to its sincere pledge of exceptional dependability.

In the chemical industry, they have proved their *extra value* in every type of service, yet *you pay no more* for Jenkins Valves. Jenkins Bros., 100 Park Avenue, New York 17. Jenkins Bros., Ltd., Montreal.

HASSALL SERVICE

SPECIAL NAILS RIVETS SCREWS
Hassall
ESTABLISHED 1850

Raw material inventory of Monel, Stainless Steel, Copper and Copper Alloys on hand. Send drawing—advise quantity. Free catalog on request.

JOHN HASSALL INC.
144 Clay Street, Brooklyn 22, N. Y.

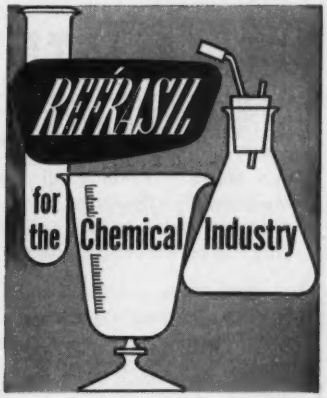
NEW HEAT SAVING EFFICIENCY

- *Longer Life*
- *Custom Molded Precision Pipe Fit*
- *Attractive, Smooth Finish*

Now available in pipe covering and block insulation, Mundet 85% Magnesia permits new heat-saving efficiency. Precision manufacturing on the latest type of automatic equipment insures uniform standards. Extra durability is built into the insulation. It does not "powder", settle or disintegrate. It is unaffected by either steam or water leakage. It maintains an attractive, smooth finish. Precision pipe fit is assured, with no spaces left for the escape of heat. You benefit from the most modern manufacturing facilities for the production of heat insulation. Write for specification information and recommendations. Mundet Cork Corporation, Insulation Division, 7101 Tonnelle Avenue, North Bergen, N. J.

MUNDET

MUNDET



REFRASIL...widely used today in many industries has rapidly become an important filtration and insulation material for the Chemical Industry.

This outstanding new product is a fibrous, high silica content, all mineral substance which is chemically stable, unaffected by ordinary acids, and is resistant to fire, water and moisture.

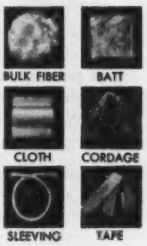
REFRASIL, light in weight and versatile in use is available in a variety of physical forms as illustrated below.

IMPORTANT FEATURES

- ★ Filtration of corrosive or high temperature materials
- ★ Chemical resistance of pure silica.
- ★ Extreme temperature resistance.
- ★ Low thermal conductivity.
- ★ Good acoustical insulation.
- ★ Catalyst or Catalyst support.

REFRASIL

CONSULTATION SERVICE
Without obligation to you, our engineers are available for consultation regarding your high temperature or filtration problems.
REFRASIL is produced in a variety of forms for your needs. Write us today, or simply attach this ad to your letterhead and mail today for illustrated literature.



REFRASIL REPRESENTATIVES

Eastern:
Fred W. Muhlenfeld
6629 Loch Hill Rd.
Baltimore 12, Md.
Valley 3133

Texas, Okla. & Kansas:
Thomson Engineering Service
708 Hemphill Dr.
Fort Worth 4, Texas
Fortune 5340

Midwest:
Bernie I. Woodin
3219 West 29th St.
Indianapolis 22, Ind.
Hickory 8683

HITCO
THE H. I. THOMPSON COMPANY
1721 CORDOVA STREET
LOS ANGELES 7, CALIF.

SPECIALISTS in PIPE FABRICATING

TO MEET THE MOST EXACTING SPECIFICATIONS

Butt Welds • Bending All Types • Coiling Machining • Threading • Beveling • Lining Pickling • Galvanizing • Sand Blasting • Preheating • Stress Relieving • Testing.

PIPE—Wrought Iron—Steel • Structural Cast Iron Copper Steel • Seamless • Electric Weld Spiral, Lap Butt Weld • Shore Dredge • SPEED-LAY.

PILING—Sheet piling, lightweight —Tubular—all size.

PILE FITTINGS—All types and sizes for steel and wood.

For Oil, Chemical, Concrete, Asphalt and other Industrial Requirements, ALBERT "Rings the Bell."

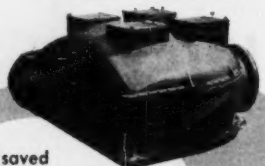
ALBERT

PIPE SUPPLY CO.

BERRY AT NORTH 13th STREET
BROOKLYN 11, N. Y.

For More Than 50 Years...

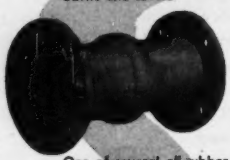
Sturdy, long-lived acid pails



This large sea-going condenser was completely lined, including baffle and covers.

• • • La Favorite Rubber Engineering has saved industry Millions of Dollars by inhibiting corrosion of process equipment through rubber lining and/or covering of pipe, tanks and hundreds of variations in process equipment.

The La Favorite method, developed over the years, has consistently proved its merit as a primary source of corrosion protection. Inspection of equipment in use for many years after lining and/or covering has disclosed that the La Favorite method of application and compounding of the rubber stock have always been equal to the life of the rubber.



One of several all-rubber expansion joints for the power plant of a public utility.

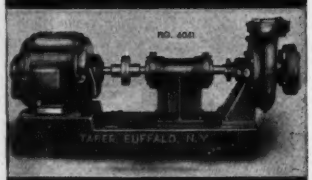
For details on lining or covering of processing lines and equipment, send blue prints for estimate of cost, or write for bulletins on your type of equipment.

LA FAVORITE RUBBER MFG. CO. 2008

269 Wagaraw Road — Hawthorne, N. J.

RUBBER LININGS • RUBBER COVERING • RUBBER ENGINEERING

PUMPS for PROCESS INDUSTRIES



BULLETIN CL-339 AVAILABLE

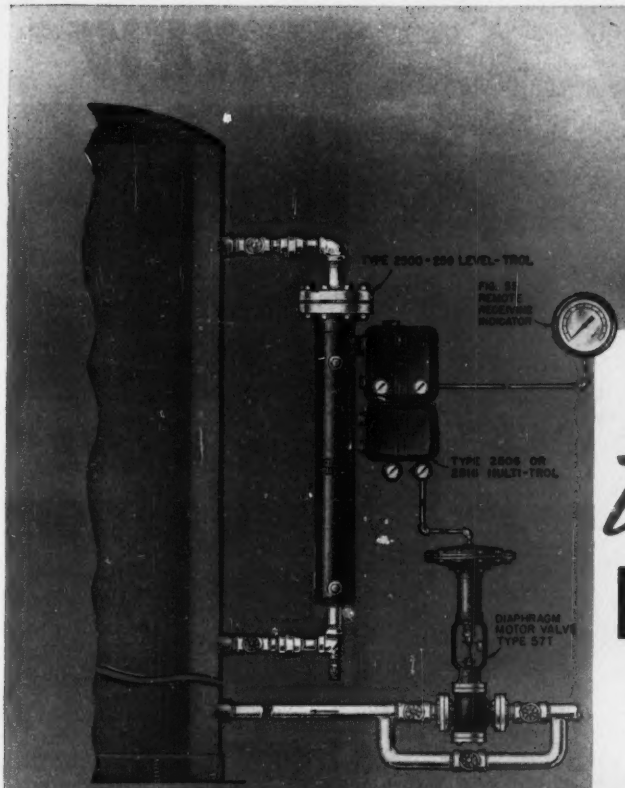
For the processing industries pumps need to be built for definite requirements. For this reason Taber Centrifugal Pumps will always prove far superior to stock or trade pumps. • For example: there is a variety of impeller combinations for given-size casings; casings of various sizes for given-size yokes; over-size ball bearings, extra size shafts; extra deep stuffing boxes—all assembled and "Performance" Rated for final requirements of your job. • This is an indication of extreme flexibility and dependability of Taber Pumps. • Also pump built of any obtainable metal or alloy found suitable by customer. • Please use your business stationery when writing for BULLETIN CL-339.

FIG. 19,447

TABER PUMP CO. *(Est. 1859)*
294 Elm St., Buffalo 3, N. Y.

TABER PUMPS

HIGHER PRACTICAL PERFORMANCE



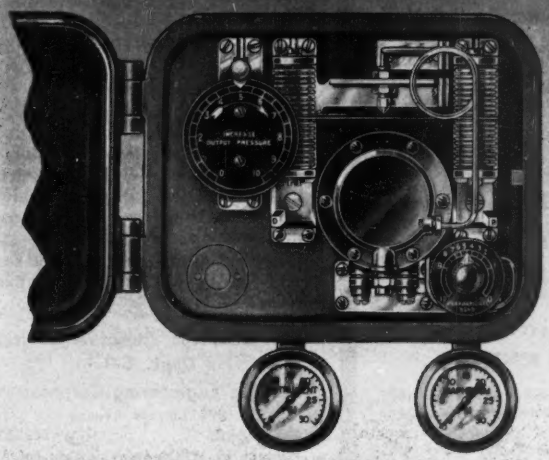
New!

FISHER®

Dual Control

LEVEL-TROL

This new Fisher Controller consists of a primary pilot (standard Fisher Series 2500 Level-Trol — used for indicating or controlling level) whose output is transmitted by pneumatic link to secondary pilot — the Multi-Trol.



MULTI-TROL FEATURES

1 — Available with reset (Type 2516) or without reset (Type 2506). (Reset may be added to units originally furnished without it.)

2 — Proportional band adjustment is incorporated into the remote receiver controller with a range of 10% to 200%.

3 — Level control point is adjustable manually in the case by level set adjustment. For remote set — provided with connection for remote air loading.

4 — Pressure balanced type of relay provides intermittent bleed and gives accurate stable control.

5 — Pilot may be changed from a direct acting to a reverse acting unit or vice-versa, thru the use of switch plates.

6 — Pilot may also be changed from proportional action to two position action or vice-versa, by repositioning a switch plate.

Complete information will gladly be sent upon request.

FISHER GOVERNOR COMPANY, MARSHALLTOWN, IOWA

FISHER® LEADS THE INDUSTRY IN RESEARCH FOR BETTER PRESSURE AND LIQUID LEVEL CONTROL

WILLSON

dependable eye protection

keeps you on the safe side

WILLSON SAFETY EQUIPMENT

Combined protection, comfort and appearance make Willson safety spectacles outstanding in value. Choose from a full range of metal and plastic frames—fitted with Super-Tough* heat-treated glass lenses, or Plas-Tough* plastic lenses—every one tested for impact resistance and optical quality. Send for catalog describing our complete line of safety equipment.

STYLE AH

METAL FRAME Latest style spectacle with single bridge. Have Hi-Line temples with a "dressy" look. Also available with side shields. (Non-flammable plastic frame Style WKS shown at top.)

CHOOSE YOUR FAVORITE LENSES FOR ANY WILLSON SPECTACLES

SUPER-TOUGH* WILLSONITE® PLAS-TOUGH*

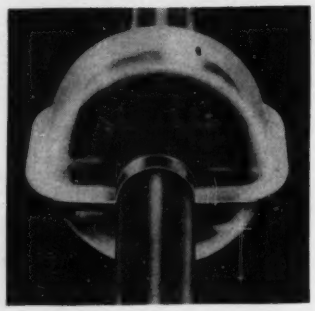
Three popular types of lenses are available for all Willson Spectacles. Clear glass Super-Tough*, Willsonite® Green Super-Tough* and the new Plas-Tough* lenses that combine the impact resistance of heat-treated glass with the comfort of lightweight plastic.

*Trademark

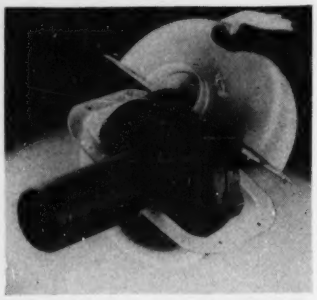
See your WILLSON distributor or write for Catalog

WILLSON PRODUCTS, Inc., 106 Thorn Street, Reading, Pennsylvania

NEW



POSITIVE PROTECTION!



Transparent Pipe Flange Shields for Corrosive Liquids Protect Personnel and equipment.

Completely covers pipe flange and provides positive visual detection of leaks. Made of polyethylene plastic—light in weight, acid resistant, non-breakable. Can be installed in a minute, removed in a second.

Comes in nine standard Sizes for 150 pounds and 300 pound pipes from ¾" to 6".

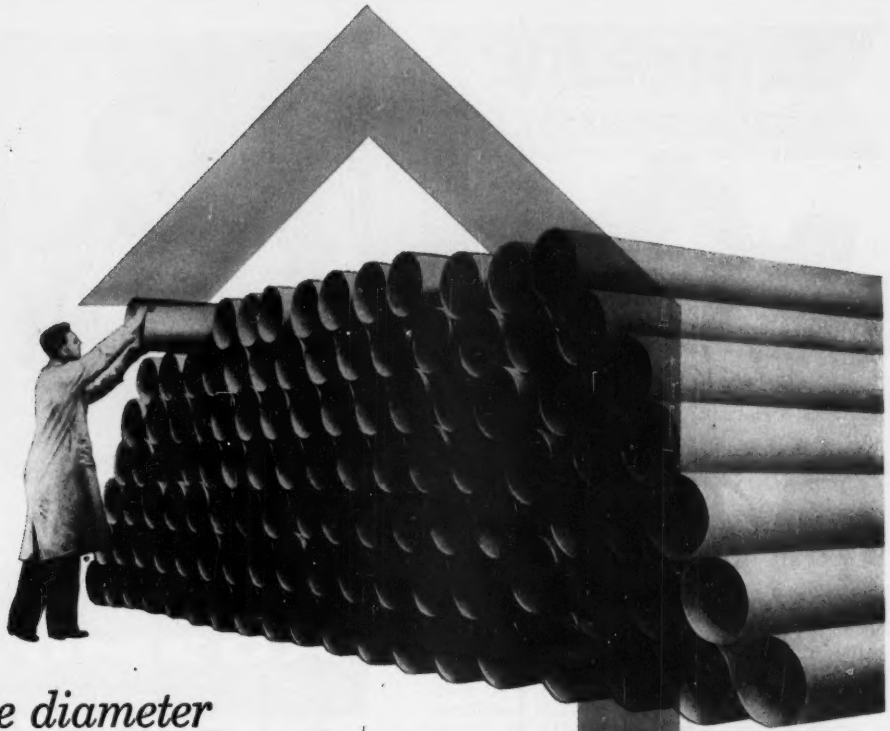
For detailed literature write:

Dept. C-1

Packing Engineering Corporation
971 Lincoln Avenue
CRANFORD, NEW JERSEY
Made by Wilmington Plastics, Inc.

ACE-O-FLEX

PACKING ENGINEERING CORP.
971 Lincoln Ave. Cranford, N.J.



Large diameter

TRENTWELD STAINLESS TUBING

for your requirements

TRENTWELD Large Diameter Stainless Steel Tubing meets precisely the tubing requirements of fabricators, designers and manufacturers of processing equipment. Available in diameters of 4" to 40" OD, TRENTWELD is precision-finished with absolutely uniform section. TRENTWELD is furnished in any finish, for fabrication with any fittings you select. Call on us.

CONDENSING LOOPS FOR HANDLING MERCURY VAPOR AT A WESTERN MINE. FABRICATED OF CR-NI STAINLESS STEEL.

TRENTWELD

STAINLESS STEEL TUBING

TRENT TUBE COMPANY, GENERAL SALES OFFICES, EAST TROY, WISCONSIN (Subsidiary of CRUCIBLE STEEL COMPANY OF AMERICA)

look to DOW for

diethyl malonate

$CH_3\text{-}CH_2\text{-}OOC\text{-}CH_2\text{-}COO\text{-}CH_2\text{-}CH_3$

Through years of research and experience, and extensive production facilities, Dow is able to provide you with chemical intermediates that you can depend upon for quality and uniformity.

Diethyl Malonate is widely used in the manufacture of barbiturates. And, because it is an excellent "building block," it is used in the syntheses of many chemical intermediates and organic pigments. Write Dow TODAY for a free sample of Diethyl Malonate for use in your specific applications.

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

properties

A colorless liquid

Boiling range at 760 mm. Hg, 5-95%	196-200°C.
Specific gravity at 25/25°C.	1.055
Freezing point	Below—20°C.
Refractive index at 25°C.	1.412
Flash point	200°F.
Fire point	205°F.

The Dow Chemical Company
Dept. FC42
Midland, Michigan

Please send me an experimental sample of DIETHYL MALONATE.

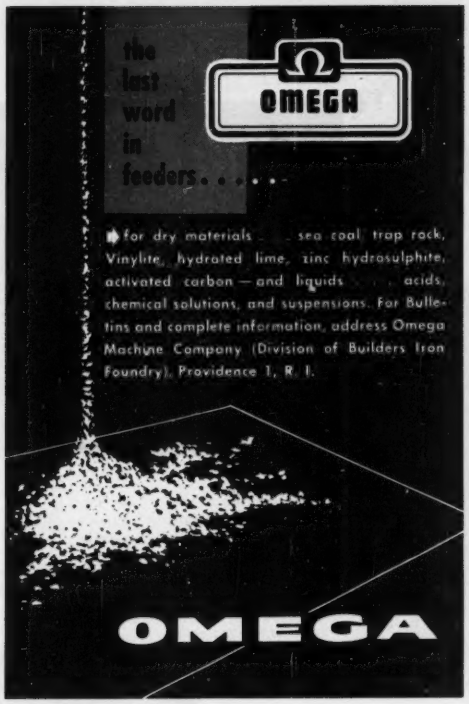
Name _____ Title _____

Company _____

Address _____

City _____ State _____

DOW
CHEMICALS
INDISPENSABLE TO INDUSTRY AND AGRICULTURE


the last word in feeders . . . . . .
OMEGA
for dry materials . . . sea coal, trap rock, Vinylite, hydrated lime, zinc hydrosulphite, activated carbon — and liquids . . . acids, chemical solutions, and suspensions. For Bulletins and complete information, address Omega Machine Company (Division of Builders Iron Foundry), Providence 1, R. I.
OMEGA

A complete steam plant backed by undivided responsibility • Shipped completely assembled • More than 80% thermal efficiency guaranteed • 4-pass design provides 5 sq. ft. of heating surface per b.h.p. • Built-in induced draft eliminates need of expensive chimney • Simple installation • Clean, quiet operation • Heavy-duty construction assures long-lived dependability

Superior Steam Generators are manufactured in 18 sizes from 20 to 600 b.h.p. for pressures up to 250 p.s.i. or for hot water heating.

For complete details, write for Catalog 322

Factory: Emmaus, Pa.

Exec. Offices: Times Bldg., Times Sq., New York N. Y.

Superior STEAM GENERATORS

WILSONIZE TO ECONOMIZE

MODEL R CUTTER HEAD 7 ways better

Here are seven good reasons why the Wilson Model R Cutter Head assures refineries and chemical plants faster, more thorough tube cleaning.

1. **Renewable Cutter Pin Bearings.** No need to replace entire cutter head when pin bearings wear.

2. **Reversible and Interchangeable.** When bearing wears on one side, just rotate it in its place for double service. When both sides are worn, it is only necessary to replace the worn bearing . . . not the whole set.

3. **Faster Cutting Speeds.** The cutter pins revolve freely, new pin bearings reduce surface wear on the wheels — less friction all around.

4. **Low, Easy Maintenance.** Self-aligning bearings are replaced with just a twist of the wrist. One nut opens the whole assembly . . . saves user's time . . . cuts downtime for tube cleaning.

5. **Self-feeding and Non-tracking . . .** won't cut tube surfaces.

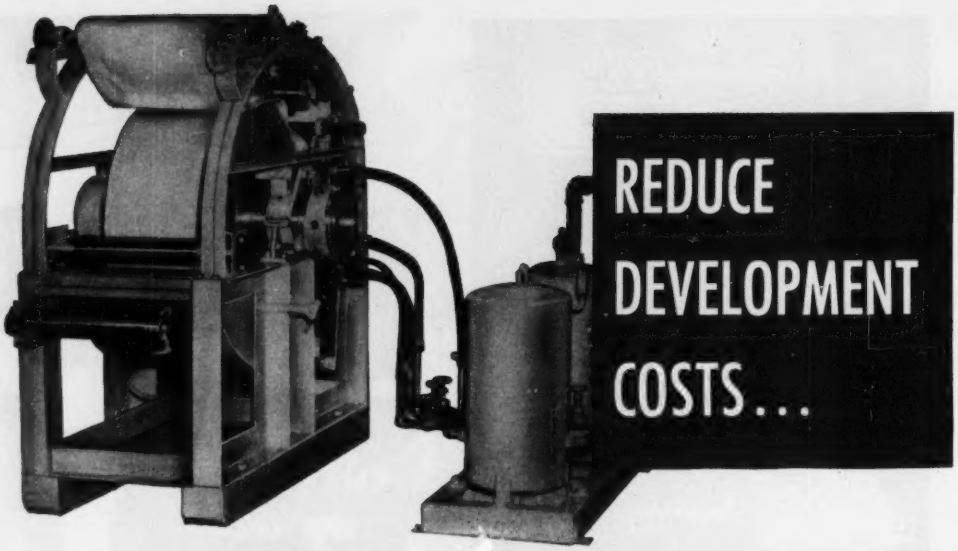
6. **Extra Expansion.** The special cutter pin bearing provides for greater radial expansion . . . permits removal of deposits of more variable thickness . . . assures more thorough cleaning.

7. **Made from the "solid" . . .** accurately made of alloy steel . . . greatest assurance of soundness . . . less likely to break in the tube.

TW 600

THOMAS C. WILSON, INC.
21-11 44th AVENUE, LONG ISLAND CITY 1, N. Y.
Representatives in all principal cities
CABLE ADDRESS: "TUBECLEAN", NEW YORK

WILSON
TUBE CLEANERS • TUBE EXPANDERS



RENT A FEinc PILOT PLANT FILTER

Here's a low-cost way to test FEinc's high performance for your process. This completely equipped small filter is just the thing for taking the "kinks" out of a process before scaling up . . . or for routine small-scale production.

FEinc's unique rental-purchase plan eliminates heavy capital expenses for experimental work. You simply pay a low monthly rental as you use the filter . . . and get a credit on the rent paid if you eventually buy any FEinc unit.

Fabricated of Type 316 stainless steel, the Pilot Plant Filter will handle almost any continuous filtration job. It has the famous FEinc String Discharge, Submergence Washing Mechanism, and Compression Dewatering Mechanism. Any of these features can be disconnected, and a scraper-type discharge is also furnished that can be attached with only four bolts.

STRING DISCHARGE

SCRAPER DISCHARGE

IMMEDIATE DELIVERY! For the first time since they were introduced in 1949, these units are now available for immediate delivery. Write us today for more details!

FILTRATION ENGINEERS, INC.
155 ORATON STREET • NEWARK 4, NEW JERSEY

SPECIFICATIONS OF FEinc PILOT PLANT ROTARY VACUUM FILTER

SIZE: 3 ft. drum dia., 1 ft. drum width. (Approx. 10 sq. ft. drum area)

CAKE THICKNESS: Handles cakes from 1/16" thick and up, including difficult slimes and fibrous materials.

WASHING: FEinc Submergence Washing Mechanism supplied, but can be disconnected if it is not necessary to your process.

DEWATERING: Normal, wide-arc vacuum dewatering supplemented by FEinc Compression Dewatering Mechanism that can be operated either as a part of or separately from the FEinc Washing Mechanism.

MATERIALS: Type 316 Stainless Steel.

CLOTH: Cotton, Nylon, Dynel, Orlon, Vinyon, Woven Wire, etc. as required.

VALVE: Automatic valve controls pickup, dewatering, washing. Quickly adjustable, easy to change over from one job to another.

INSTALLATION REQUIREMENTS: No foundation required. All major piping furnished, ready for connection to your vacuum source.

AGITATOR: Separately driven oscillating agitator.

MOTOR DRIVES: Trouble-free, variable speed motor drive permits instant adjustment of drum speed to meet variations in filtering conditions. Agitator and filter motors each ¼ H.P., 1750 RPM, 220/440 v, 3 ph., 60 cyc., Class I, Group D.

FILTER DIMENSIONS: 4' long x 4'9" wide x 5' high.

SHIPPING WEIGHT: 2700 lbs. with accessories.

for QUICK, ACCURATE MEASUREMENTS

Here are four instruments widely used by industry for a large variety of measuring needs . . . highly valued for their accuracy, dependability, and convenience . . . backed by Meriam's 37 years' specialization in the field of measurement.

U-Type Absolute Pressure Gauge

For the measurement of *absolute pressures* from one millimeter of mercury to the equivalent atmospheric pressure. Of simple design—accurate and dependable. Gauge head fastens to body by a single wing nut. Available in wall or flush front mounting styles. Ask for catalog sheet C-1142 WM.

Clean-Out U-Type Manometer
(Model B-1169 WM)

Semi-steel clean-out head is removable from body frame for filling and cleaning U-tube. For line pressures up to 100 lbs. per sq. in. Large bore "pyrex" tubing 3/16" inside diameter gives flat indicating fluid meniscus. Bold ½" high scale numerals provide for distant reading. Ask for catalog sheet B-1169 WM.

Well Type Manometer
(Table Mounting)

For portable service in the field, production testing, or in the laboratory. Glass tubing is gland packed at each end block and is supported at spaced intervals to prevent tube distortion. Also available for wall mounting, pipe mounting, and flush front panel mounting. Ask for catalog sheet A-203 TM.

Well Type Manometer
(Front-of-Board Mounting)

The instrument body channel, scale, and indicating tube mount to the front of the panel; instrument well mounts behind panel. Connections are made behind the mounting panel. Provides an accurate, quick, and direct method of measurement. Ask for catalog sheet A-324 FB.

THE MERIAM INSTRUMENT CO.
10918 MADISON AVENUE • CLEVELAND 2, OHIO
Western Division: 4760 E. Olympic Blvd., Los Angeles 22, Calif.
In Canada: Peacock Bros., Ltd., Montreal

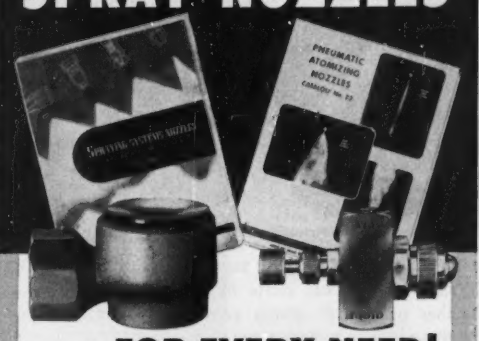
MERIAM Instruments
ESTABLISHED 1911
MANOMETERS, METERS AND GAUGES FOR THE ACCURATE MEASUREMENT OF PRESSURES, VACUUMS AND FLOWS OF LIQUIDS AND GASES

SARCO WATER BLENDERS

A 3-way mixing valve which provides any set temperature regardless of the incoming hot or cold water pressures and temperatures. Used for washrooms, process work and engine jacket cooling. Several types available; sizes ½" to 4". Cat. No. 800.

292
SARCO SAVES STEAM
IMPROVES PRODUCT QUALITY AND OUTPUT
SARCO COMPANY, INC.
Represented in Principal Cities
Empire State Building, New York 1, N. Y.
SARCO CANADA, LTD., TORONTO 8, ONTARIO

SPRAY NOZZLES



. . . FOR EVERY NEED!

CLIP AND MAIL

For lower cost and more efficient spraying try Spraying Systems Spray Nozzles. Complete type and size selection for every need. Write for Catalogs.

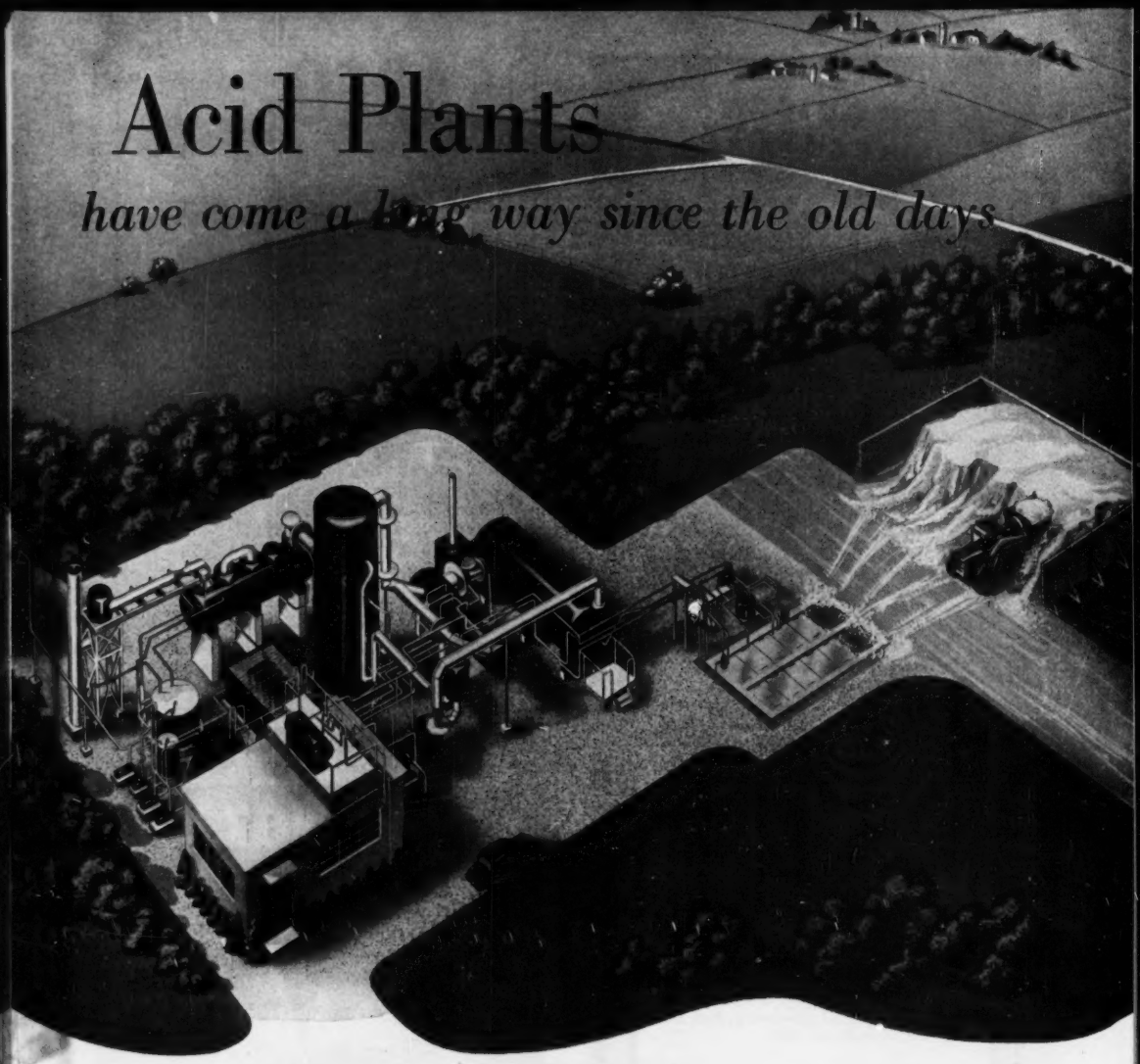
SPRAYING SYSTEMS CO.
3275 Randolph Street • Bellwood, Illinois

☐ Send me Catalog No. 22 ☐ Send me Catalog No. 23

Name_____
Company Name_____
Address_____
City_____ State_____

Acid Plants

have come a long way since the old days



At the turn of the century, virtually all sulfuric acid was made by the chamber process. A 50-ton per-day unit was a large installation and chamber acid had a maximum strength of 77 per cent.

Today's contact acid plants are a far cry from the old days. Units are modern and functional in design—efficient and reliable in operation. Single units producing up to 500 tons per day are becoming commonplace and acid of any strength is produced.

Chemico is responsible for many of the developments that account for this vast improvement. Chemico pioneered and pointed the way in the use of—

a. Pre-molten brimstone and spray sulfur burners

b. Pre-dried air for combustion of sulfur

c. Centrifugal blowers and pressure sulfur furnaces

d. Boilers to utilize waste heat of sulfur combustion

e. Economizers to utilize converter heat

f. Highly efficient, non-poisonable vanadium catalyst

g. Quench converters for high catalytic conversion

h. Acid wastes for production of fresh acid

These advances resulted in simpler, more reliable plants—higher efficiency—lower investment—conservation of manpower. Today more than ever, Chemico designed and built plants are profitable investments.

CHEMICAL CONSTRUCTION CORPORATION

A UNIT OF AMERICAN CYANAMID COMPANY

488 MADISON AVENUE, NEW YORK 22, N. Y.

TECHNICAL REPRESENTATIVES: CYANAMID PRODUCTS LTD., LONDON • CHEMICAL CONSTRUCTION (INTER-AMERICAN) LTD., TORONTO • SOUTH AFRICA CYANAMID (PTY) LTD., JOHANNESBURG

Chemico plants are profitable investments

CC 239

NOW AVAILABLE

Reprints of the February Chemical Engineering Report

THE BATTLE FOR PRODUCTION

Chemical Engineering's 29th annual review and statistical issue. A survey of the chemical industry at the half-way mark in its huge program for putting up plants to turn out the goods for an arsenal economy.

Plants & Facilities
Expenditures, past and planned, for expanding capacity.

Processes & Technology
Normal growth and rearmament requirements spur production.

Mobilization
How Washington is grappling with shortages.

Labor & Manpower
The days of manpower austerity are arriving.

Profit & Loss
Chemical profits wilt as the tax bite grows bigger.

Supply & Demand
Slowly the gap between demand and supply is being closed.

48 pages of facts and figures to help you keep abreast of what has happened and what is happening in the chemical process industries. Ask for reprint B-186. Price $1. Send orders with remittance to:

Chemical Engineering
Attention: M. Molin
330 West 42nd St.
New York 36, N. Y.

NOW added versatility for the Beckman Model B Spectrophotometer . . .

A NEW REFLECTANCE ACCESSORY that simplifies color evaluation

To further increase the wide range versatility of the well-known Beckman Model B Spectrophotometer, a new Reflectance Accessory is now available for use on opaque, colored samples in solid, liquid or powder form. There are many useful applications for this accessory in the precise evaluation and comparison of color intensities and hues.

For example, diffuse reflectance measurements are useful for accurately controlling the whiteness of talc . . . for controlling artificial coloring of foodstuffs such as butter, catsup, and condensed milk . . . for calculation of dye bath recipes in textile processing . . . for grading the color of paper and the whiteness of flour . . . for matching and controlling shades of powder, paste and liquid, paints and inks and many other products where accurate color measurements are essential.

SEND FOR NEW BULLETIN

Complete information on the new Reflectance Accessory is contained in a new bulletin describing the unit in precise detail. It's ready to send. Ask your nearest Beckman representative dealer for Bulletin 2231—or write direct.

BECKMAN INSTRUMENTS

SOUTH PASADENA 12, CALIF.

Fisher Scientific Company
Chicago • New York • Los Angeles

Spectrophotometers, pH Meters and Electrochemical Instruments—Spectroscopy, Optics—Glassworking

Easily Installed

The attachment consists of an integrating sphere in holder and a sliding sample tray which are easily installed in place of the standard Model B sample compartment and cell carriage.

Precise Measurements

To permit utmost measurement precision, a detent mechanism operated by a convenient push button in the sample tray knob exactly reproduces forward and backward position of the sliding sample tray. The resulting precision is particularly valuable for accurate measurements on samples with rough surfaces or non-homogenous colors.

Readings taken rapidly are reproducible to at least 1%—with careful technique even greater precision is obtained.

Operating Convenience

Special provision has been made so that liquid samples can be conveniently inserted without spilling . . . powdered samples without disturbing the smoothed surface.

Sample Size

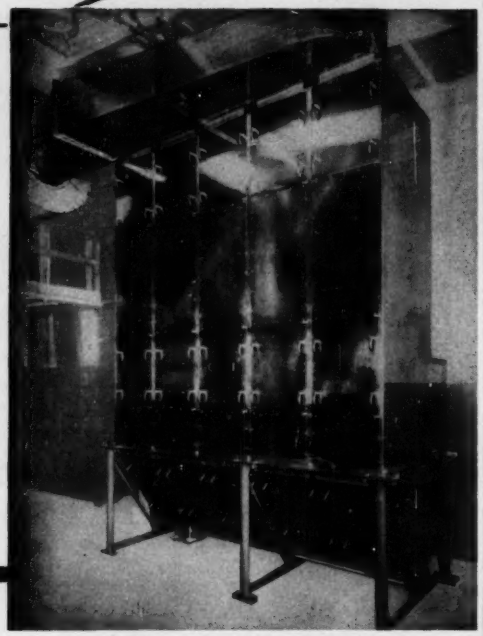
Sample size is approximately 1" x 1 1/4" with a maximum thickness of 5/16"—ample for most applications. Or, by simply rotating the sphere 180° in its holder, larger samples can easily be accommodated.

Quick, Easy Readings

Accurate color measurements are made with great speed and simplicity. First the instrument is adjusted to read 100% reflectance on a white standard (such as MgO), the sample is moved into position and the percent reflectance (compared to the standard) is then read directly from the meter. It's as simple as that—and the three-compartment sample tray permits quick comparison of two samples and a standard on each run.

$ave $ out of DU$T

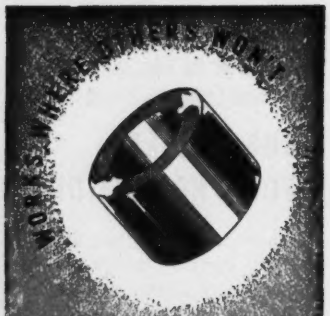
$AVE DOLLAR$ OUT OF DU$T
In Processing of
FERTILIZERS
PLASTICS
DRUGS & COSMETICS
FOOD MATERIALS & OTHER PRODUCTS



The Simon Suction Filter Dust Collector
U. S. Design and Manufacture by
ENTOLETER DIVISION

Dust problems are effectively solved with the Simon Suction Filter Dust Collector. This self-contained, all-metal unit needs no accessory equipment except a fan and connecting ducts. Dust is collected at practically 100% efficiency, permitting air to be blown out of the chemical plant without costly loss of materials, or into the building without risk of dusty atmosphere. Cleaned air from collector can be returned to plants to save heat in winter, and blown outside in summer to control humidity • Streamlined ALL METAL design with minimum ledges and dead spots • Minimum maintenance cost • Low power — 1-HP to operate 12-section unit • Operates under suction, eliminating dust leaks. Send for complete information. ENTOLETER DIVISION, The Safety Car Heating and Lighting Co., Inc., 1197 Dixwell Ave., New Haven 4, Connecticut.

ENTOLETER
CENTRIFUGAL MACHINES

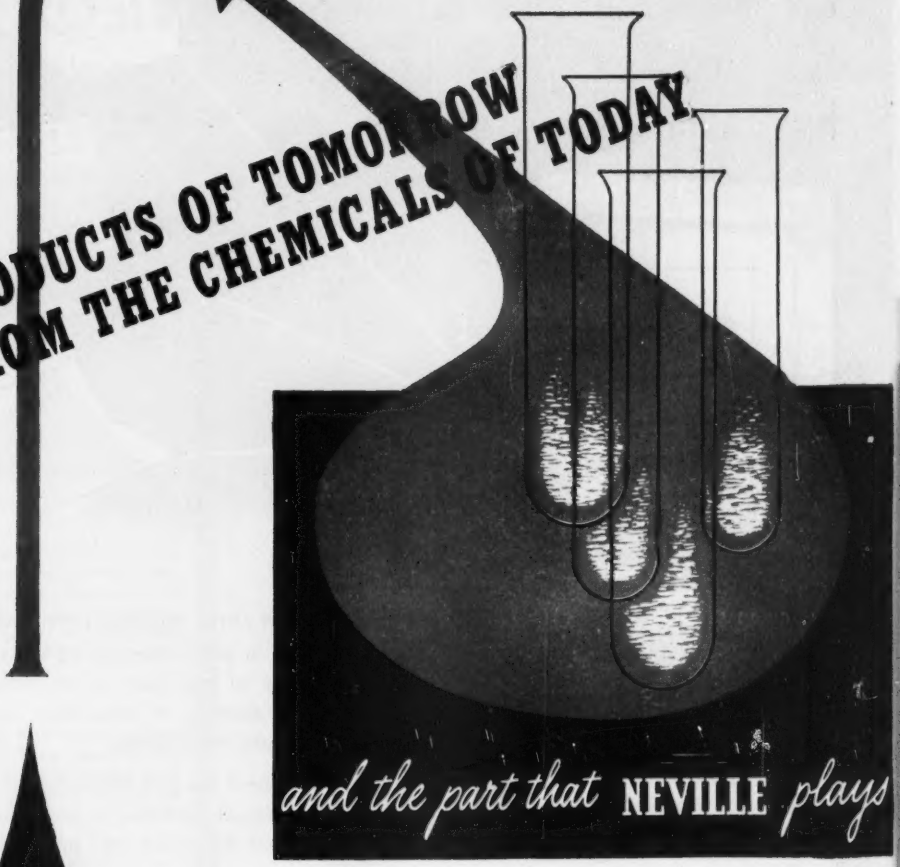


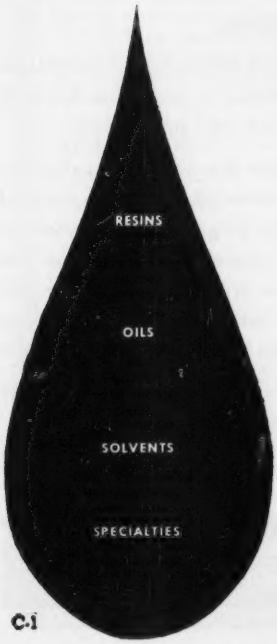
SPECIFY GRAPHALLOY WITH CONFIDENCE

- OPERATE DRY or SUBMERGED IN DYES, PLATING, CLEANING & CHEMICAL SOLUTIONS, GASOLINE, FOODSTUFFS
- TRULY OILLESS AND SELF-LUBRICATING
- EXTREMELY DURABLE
- CONSTANT COEFFICIENT OF FRICTION
- APPLICABLE OVER A WIDE TEMPERATURE RANGE—even where oil solidifies or carbonizes
- EXTENSIVELY USED IN CONVEYORS, PUMPS & OVENS
- ROTATING SEALS OF GRAPHALLOY ARE UNEXCELLED

GRAPHITE METALLIZING CORPORATION
1024 NEPPERHAN AVENUE, YONKERS 3, NEW YORK

PRODUCTS OF TOMORROW FROM THE CHEMICALS OF TODAY





C-1

Neville, through its years of research and development, has contributed a major share to meeting the demand for products that look better, wear longer and prove more economical in use. That is why Industry chooses Neville Resins in ever-increasing volume.

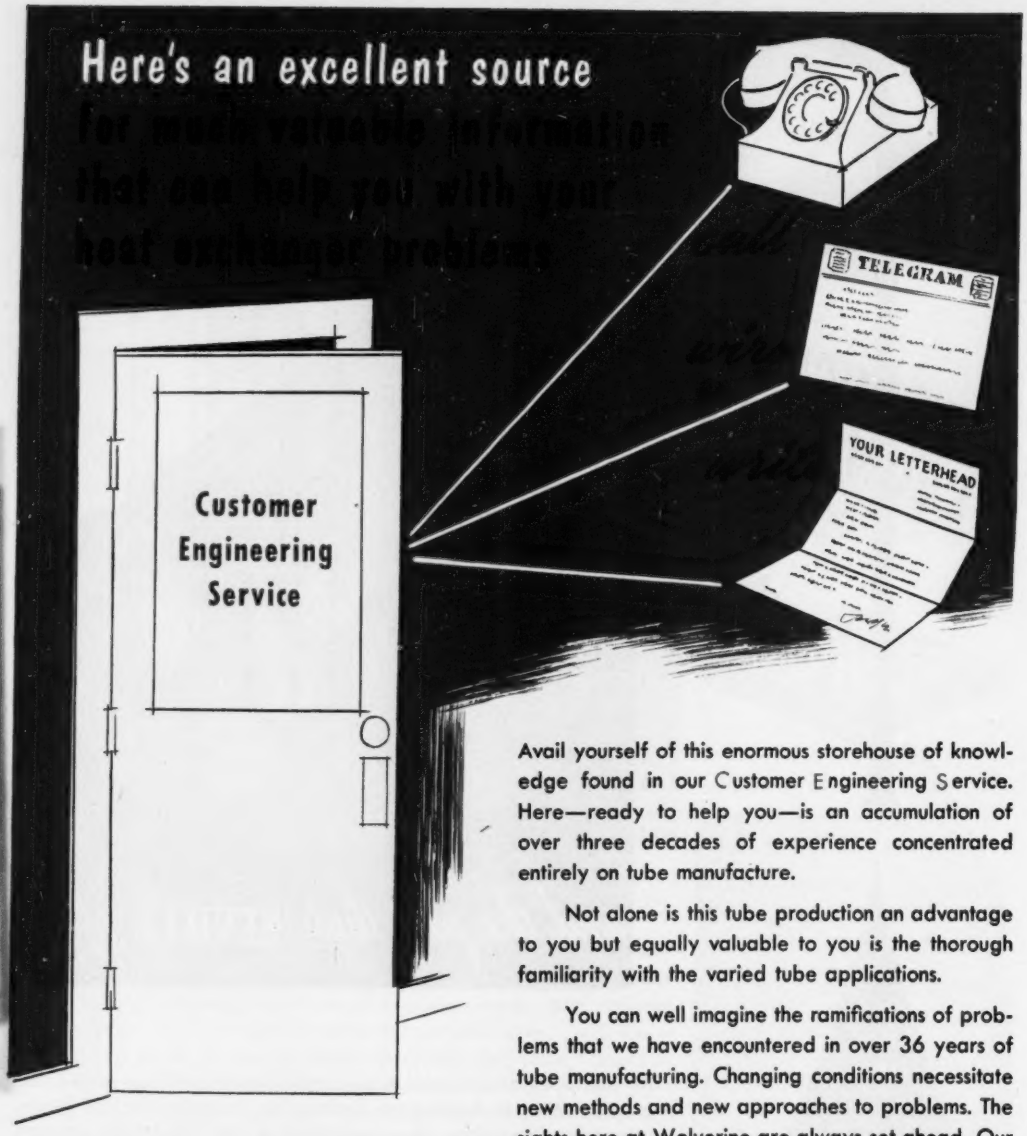
These resins are used to manufacture such varied consumer goods as rubber products, floor tiles, paints and varnishes, adhesives, chewing gums, citrus preservation, phonograph records, cigarette paper, wood preservatives, printing inks, etc.

Write for information on your particular applications.

THE NEVILLE COMPANY • PITTSBURGH 25, PA.

Plants at Neville Island, Pa., and Anaheim, Cal.

Here's an excellent source



Avail yourself of this enormous storehouse of knowledge found in our Customer Engineering Service. Here—ready to help you—is an accumulation of over three decades of experience concentrated entirely on tube manufacture.

Not alone is this tube production an advantage to you but equally valuable to you is the thorough familiarity with the varied tube applications.

You can well imagine the ramifications of problems that we have encountered in over 36 years of tube manufacturing. Changing conditions necessitate new methods and new approaches to problems. The sights here at Wolverine are always set ahead. Our technicians are always ready for you with the best answers that will improve your efficiency in operation.

Let us relieve you of some of the problems dealing with heat exchangers, condensers, etc.

WOLVERINE TUBE DIVISION
Calumet & Hecla Consolidated Copper Company
INCORPORATED
Manufacturers of seamless, nonferrous tubing
1427 CENTRAL AVE. · DETROIT 9, MICH.

PLANTS IN DETROIT, MICHIGAN AND DECATUR, ALABAMA
Sales Offices in Principal Cities

Export Department, 13 E. 40th St., New York 16, N. Y.

SCRUBBING CORROSIVE GASES?

Fig. 645

Are your scrubbing nozzles as efficient as you think they could be? Do they resist the corrosion or wear conditions satisfactorily — produce the breakup and distribution you would like?

Outline your spray problem for us—if your liquid can be sprayed with direct pressure at all—Monarch can furnish the nozzles.

NOZZLES FOR:

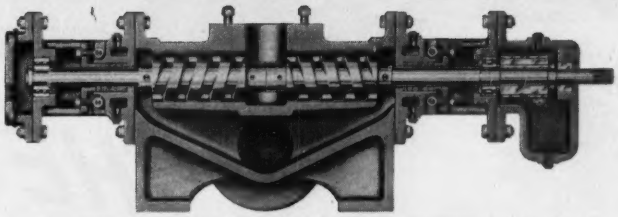
- OIL ATOMIZING
- HUMIDIFYING
- AIR WASHING
- DESUPERHEATING
- SPRAY PONDS
- MILK POWDERING
- ACID CHAMBERS
- CONCRETE CURING

Write for Catalogs 6-A and 6-C

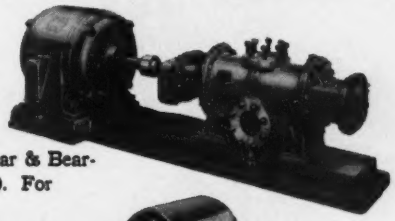
MONARCH MFG. WKS., INC.
2517 E. ONTARIO ST.
PHILADELPHIA 34, PA.

Complete NEW Line of

Sier-Bath SCREW PUMPS

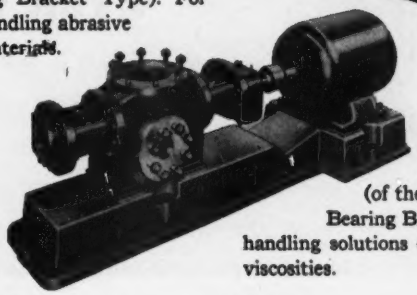


NEW EXTERNAL GEAR & BEARING BRACKET TYPE For handling non-lubricating fluids, semi-fluids. Capacities 1-700 GPM; Discharge 1000 PSI for viscous liquids, 500 PSI for water.



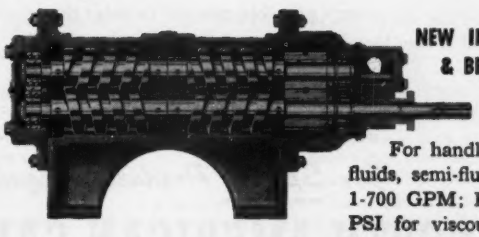
NEW LINER TYPE

(of the External Gear & Bearing Bracket Type). For handling abrasive materials.



NEW HOPPER TYPE

(of the External Gear & Bearing Bracket Type). For handling solutions of extremely high viscosities.



NEW INTERNAL GEAR & BEARING TYPE

For handling lubricating fluids, semi-fluids. Capacities 1-700 GPM; Discharge 1000 PSI for viscous liquids, 500 PSI for light oils.

WRITE FOR NEW *"Screw Pump Reply Sheet"*

Read the front side for features and advantages—then, if you wish, fill out the reverse side for a prompt, individually-engineered recommendation!

***Sier-Bath* GEAR and PUMP CO., Inc.**
9259 Hudson Blvd., North Bergen, N. J.
Founded 1905 Member A.G.M.A.

Also Manufacturers of Precision Gears and Flexible Gear Couplings

THE BEST PARTNER

A CHEMICAL SHIPPER EVER HAD!

Your North American tank car works day in and day out, year after year, never stopping but to load and unload your products and for maintenance. Here's truly a business partner worth many times its keep . . . the strongest member of any chemical shipper's team. And today, with a critical shortage of specialized tank cars, your North American partner is working harder than ever . . . keeping on the go every possible minute to meet the tremendous demands of the growing chemical industry. Remember—on the rails and in its offices, North American is your partner for fast, economical transportation and helpful, experienced shipping advice.

For Special Products Requiring Special Care

NORTH AMERICAN CAR CORPORATION

NORTH WESTERN REFRIGERATOR LINE COMPANY

A NATIONWIDE ORGANIZATION WITH BRANCH OFFICES IN IMPORTANT MARKET CENTERS

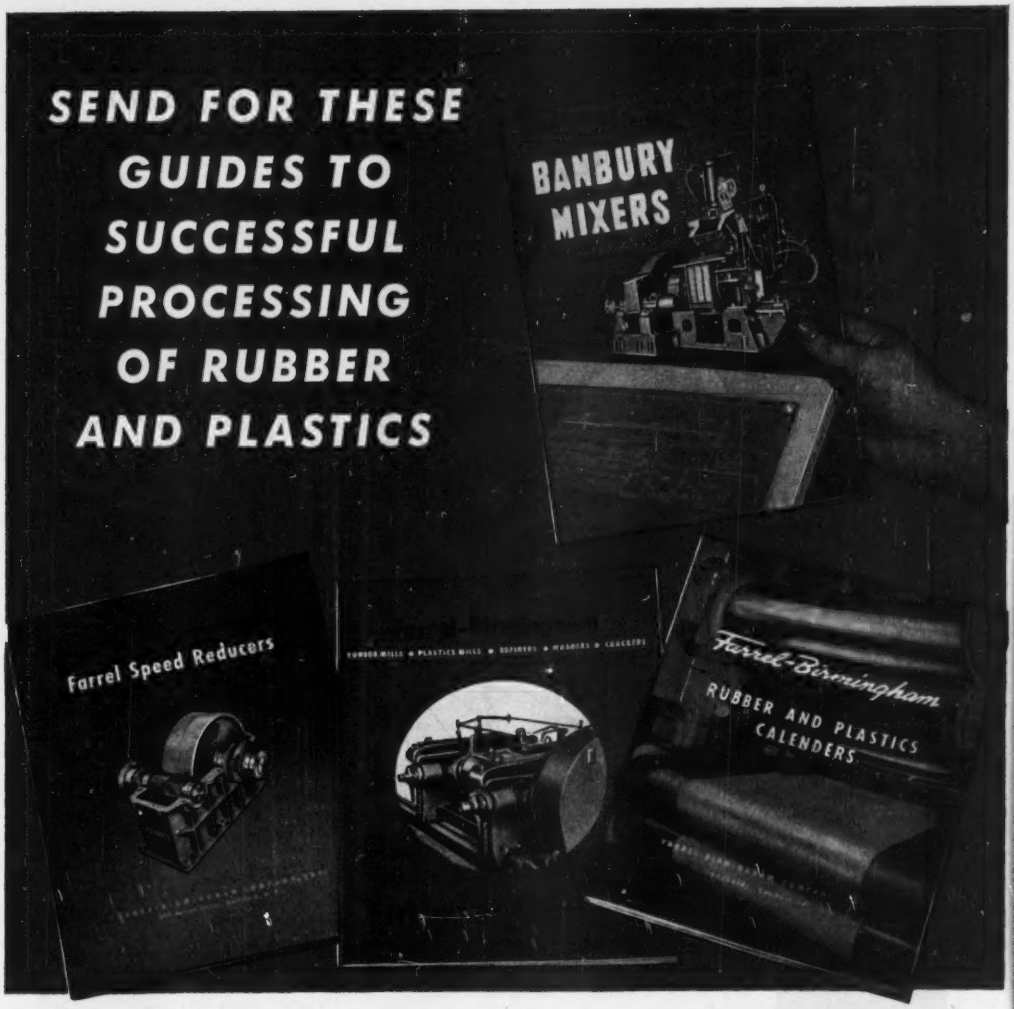
231 South LaSalle Street, Chicago 4, Illinois

RIO GRANDE NATIONAL BLDG., DALLAS, TEXAS SHELL BUILDING, ST. LOUIS 3, MO.

341 KENNEDY BUILDING, TULSA, OKLA. 681 MARKET STREET, SAN FRANCISCO 5, CALIF. 60 EAST 42ND STREET, NEW YORK 17, N. Y.

91 SOUTH MAIN STREET, FOND DU LAC, WIS 739 PILLSBURY AVENUE, ST. PAUL 4, MINN.

SEND FOR THESE GUIDES TO SUCCESSFUL PROCESSING OF RUBBER AND PLASTICS



If you buy, specify or are in charge of the operation of rubber or plastics processing equipment, you should have copies of these fact-filled bulletins.

In the last few years, Farrel-Birmingham has pioneered many developments in processing methods and equipment, which have resulted in products of greatly improved quality and economies in production.

You will find details of these improvements in the above bulletins describing three of the most important units used in the production of rubber and plastics—Banbury mixers, mills and calenders. The fourth bulletin illustrated gives complete specifications of Farrel speed reducers, which are so widely used with these production machines.

Farrel-Birmingham®

For free copies of any of the bulletins pictured here, just fill out the coupon and mail it today.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT
Plants: Ansonia and Derby, Conn., Buffalo, N.Y.
Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston

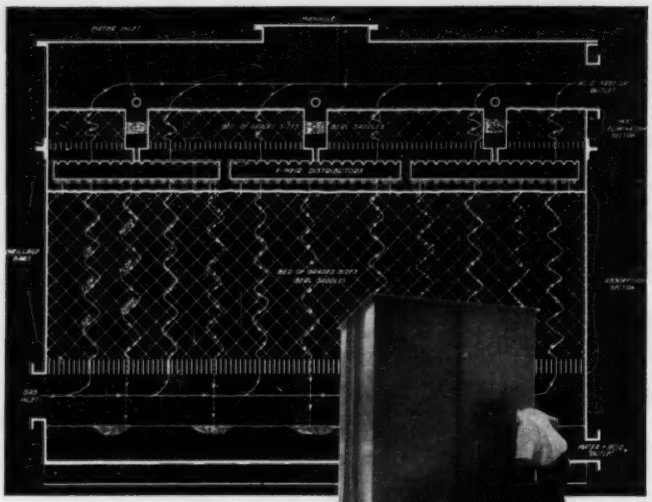
FB-756

FARREL-BIRMINGHAM COMPANY, INC. CE
ANSONIA, CONNECTICUT

Please send me, without cost or obligation, copies of the bulletins checked below.

- ☐ No. 189 BANBURY MIXERS
- ☐ No. 174 FARREL-BIRMINGHAM CALENDERS
- ☐ No. 173 FARREL-BIRMINGHAM MILLS
- ☐ No. 449 FARREL SPEED REDUCERS

Name_____ Title_____
Company_____
Address_____
City_____ State_____



Cross section of typical Knight fume washer.

Eliminate *CORROSIVE FUMES!*

In designing Fume Washers Knight engineers consider individual space and weight limitations, water consumption and fan power, as well as service conditions involved. The result is an engineered functional unit "tailored" to meet your specific requirements. Of Pyroflex or Permanite Construction (depending on service) for complete corrosion resistance, these units utilize Berl Saddles to insure peak performance. Although individually engineered for maximum efficiency, Knight fume washers are relatively low in cost and economical in operation. Some of the jobs handled by these complete functional units include:

Write for Bulletin No. 9-B, Fume Washers

Removal of HCL fumes
Removal of chlorine fumes
Removal of hydrofluoric acid fumes
Removal of dust from exhaust gas
Production of dilute muriatic acid
Cooling hot acid gases for processing
Suppression of oil and acid mists
Cooling and removing dust from gases and many other types of service.

When writing for information please include full details regarding service conditions.

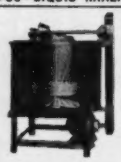
Maurice A. Knight 107 Kelly Ave., Akron 6, Ohio
Acid and Alkali-proof Chemical Equipment

DURABILITY & DEPENDABLE SERVICE

Over 80 years of Ross experience in the manufacture of Mills and Mixers of all types assures the proper selection of equipment to fit your specific processing requirements.

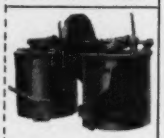
#36—LIQUID MIXER

#30C—CHANGE CAN MIXER

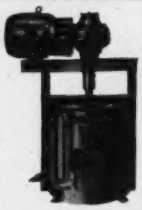


#36D—DRY MIXER

#131AB — CHANGE TANK MIXER



#36RM—TWIN SEMI-PASTE MIXER



#132—HEAVY DUTY PASTE MIXER

#41L—STEAM-JACKETED HEAVY DUTY KNEADER

#130EL—VARIABLE SPEED LABORATORY MIXER

#42 — HORIZONTAL MIXER

Write for further details!

Mixers available in laboratory, pilot scale, and large production sizes.

CHARLES ROSS & SON COMPANY
152 CLASSON AVENUE
BROOKLYN 5, N. Y.

he's working for you

THIS FELLOW IS TRAINED IN YOUR BUSINESS. His main duty is to travel the country — and world — penetrating the plants, laboratories and management councils . . . reporting back to you every significant innovation in technology, selling tactics, management strategy. He functions as your all-seeing, all-hearing, all-reporting business communications system.

THE MAN WE MEAN IS A COMPOSITE of the editorial staff of this magazine. For, obviously, no one individual could ever accomplish such a vast business news job. It's the result of many qualified men of diversified and specialized talents.

AND, THERE'S ANOTHER SIDE TO THIS "COMPOSITE MAN," another complete news service which complements the editorial section of this magazine — the advertising pages. It's been said that in a business publication the editorial pages tell "how they do it"—"they" being all the industry's front line of innovators and improvers — and the advertising pages tell "with what." Each issue unfolds an industrial exposition before you—giving a ready panorama of up-to-date tools, materials, equipment.

SUCH A "MAN" IS ON YOUR PAYROLL. Be sure to "listen" regularly and carefully to the practical business information he gathers.

McGRAW-HILL FOR BUSINESS

McGRAW-HILL PUBLICATIONS

hot liquids

corrosives

Buy **WILFLEY** *for cost saving performance*

Companion to the famous **WILFLEY** *Sand Pump*

acids

• For more efficient performance...greater economy of operation...specify WILFLEY "AF Acid Pumps. Dependable, trouble-free operation, on a round-the-clock schedule, with consequent stepped-up production and worthwhile power savings, are big reasons why modern chemical and processing plants all over the world now rely on WILFLEY Acid Pumps for handling acids, corrosives, hot liquids and mild abrasives.

• Available in 10- to 2,000-G.P.M. capacities, 15- to 150-ft. heads and higher. Wetted parts of practically all machineable alloys. Plastic lined models available. Every application individually engineered. Write or wire for details.

WILFLEY *Acid* **PUMPS**

A. R. WILFLEY & SONS, Inc., Denver, Colorado, U.S.A.

New York Office: 1775 Broadway • New York City

IDEA-PLASTICS

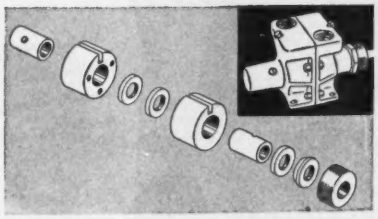
. . . from Du Pont Polychemicals Department

"TEFLON"

pump parts won't pit, gall, shrink, crack or harden, even in acids

Finding durable materials for the impeller, bearing and packing in chemical process pumps is sometimes a difficult problem for pump manufacturers. Conventional bearings are often subject to erosive pitting . . . impellers tend to gall after short periods of use. But one manufacturer found the solution for all 3 parts in one material—Du Pont "Teflon" tetrafluoroethylene resin.

"Teflon" is inert to all chemicals and solvents except molten alkali metals and fluorine under extreme conditions . . . does not impart any taste, color or odor to the product transferred. It has an extremely low coefficient of friction. Even when operated in acids, the bearings are not subject to erosive pitting. The impellers made of filled "Teflon" won't gall, shrink, swell, crack or harden in use. And the "Teflon" packing withstands high pressures in temperatures up to 500°F.



"Teflon" is also widely used in the chemical industry as a gasket material. Its unique dielectric properties serve the electrical industry in many types of insulation. And this heavy-duty plastic shows promise for many new applications, especially those where extreme service conditions are encountered.

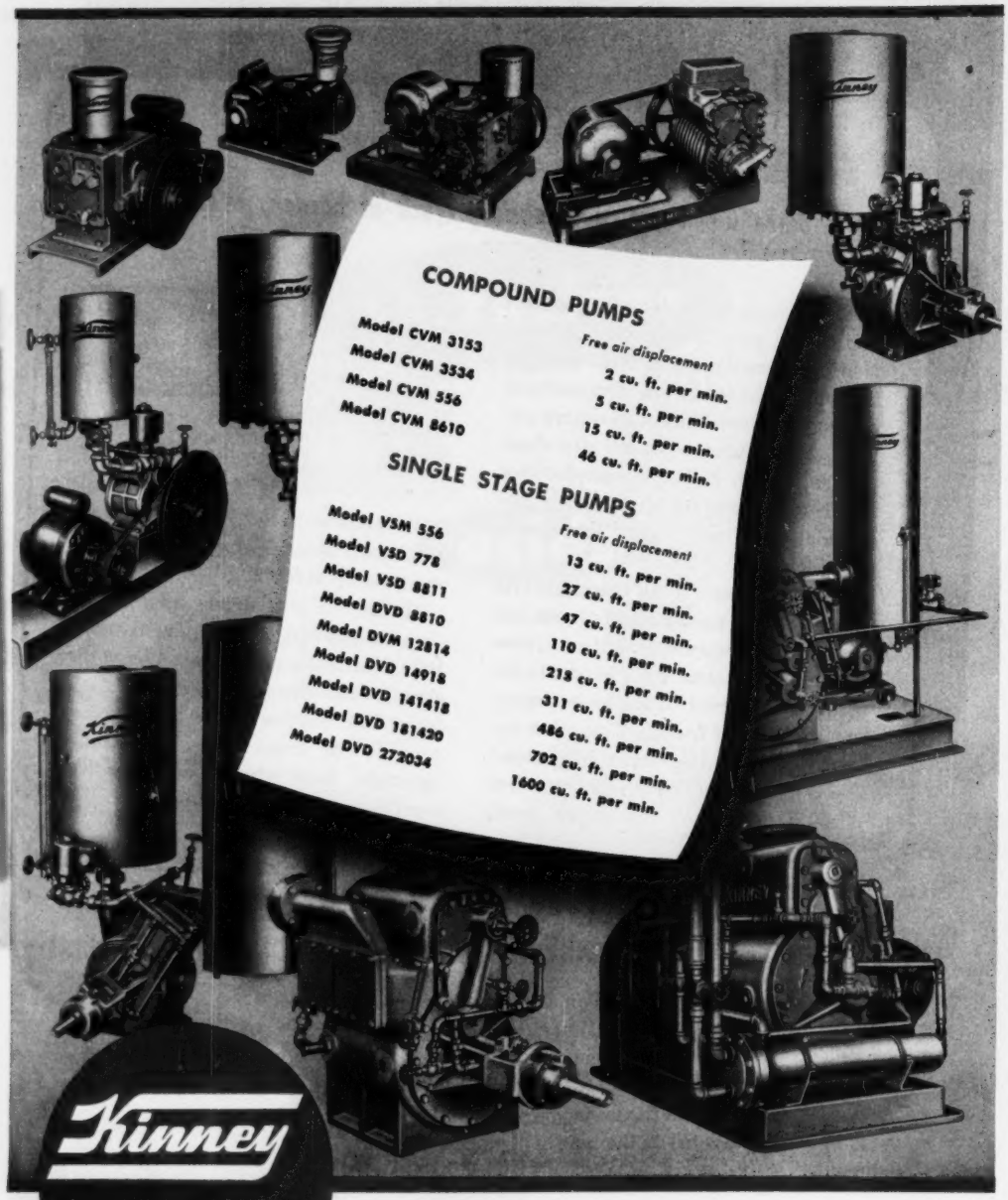
Write for technical booklet on Polychemicals products for your industry

Technical bulletins on "Teflon" tetrafluoroethylene resin and the chemicals and plastics used in your industry are available. Each product bulletin in the booklet presents physical and chemical properties, description, specifications, uses and possible applications, bibliography and other data. Write us on your business letterhead for your copy—and please tell us the type of application that you have in mind.

E. I. du Pont de Nemours & Co. (Inc.),
Polychemicals Department, 157E Nemours Building
Wilmington 98, Delaware

DU PONT
REG. U.S. PAT. OFF.
150th Anniversary
BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY
Polychemicals
DEPARTMENT
PLASTICS • CHEMICALS

THE BIG LINE OF VACUUM PUMPS



COMPOUND PUMPS

	Free air displacement
Model CVM 3153	2 cu. ft. per min.
Model CVM 3334	5 cu. ft. per min.
Model CVM 556	15 cu. ft. per min.
Model CVM 8610	46 cu. ft. per min.

SINGLE STAGE PUMPS

	Free air displacement
Model VSM 356	13 cu. ft. per min.
Model VSD 778	27 cu. ft. per min.
Model VSD 8811	47 cu. ft. per min.
Model DVD 8810	110 cu. ft. per min.
Model DVM 12814	213 cu. ft. per min.
Model DVD 14918	311 cu. ft. per min.
Model DVD 141418	486 cu. ft. per min.
Model DVD 181420	702 cu. ft. per min.
Model DVD 272034	1600 cu. ft. per min.

Kinney VACUUM PUMPS

There's a Kinney Pump for every vacuum requirement. Write for Bulletin V-518. Kinney Manufacturing Co., 1551 Washington St., Boston 30, Mass. Representatives in New York, Chicago, Cleveland, Philadelphia, Houston, New Orleans, Los Angeles, San Francisco, Seattle. **FOREIGN REPRESENTATIVES:** Gen'l Engineering Co., Ltd., Radcliffe, Lancs., England. • Horrocks, Roxburgh Pty., Ltd., Melbourne, C. I. Australia • W. S. Thomas & Taylor Pty., Ltd., Johannesburg, South Africa • Novelectric, Ltd., Zurich, Switzerland • C.I.R.E., Piazza Cavour 25, Rome, Italy.

if your problem is to

GRANULATE
CRACK
PULVERIZE
SHRED
FLAKE

consider the SPROUT-WALDRON

ROLLER MILL

Here is a Roller Mill that has many size reduction uses in the processing industries.

Equipped with rolls of correct corrugations and run at proper differentials, it will: granulate your product, crack it, pulverize it, shred it or flake it. For many products it is the most economical grinder.

For full details about the Sprout-Waldron Roller Mill write to Sprout-Waldron & Co., Inc., 15 Logan Street, Muncy, Pa.

When you have a size reduction problem it will pay you extra dividends to consult with Sprout-Waldron. Nowhere else will your problem receive as impartial an analysis—nowhere else will you find as wide a range of types of machines, nor as wide a range of sizes and styles of each type.

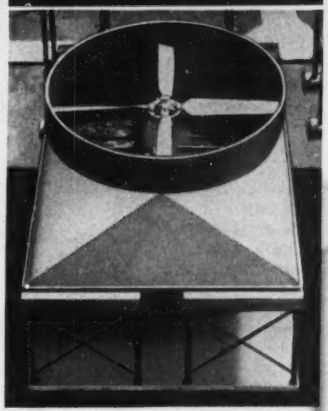
SW MUNCY, PA.

SPROUT-WALDRON

The Best in PROCESSING EQUIPMENT *Since 1866*

246

Aeromaster FANS CUT POWER COSTS 10%!



Aerodynamic design provides more cooling per horsepower

In every case where Koppers new Aeromaster Fans have been installed, power costs have gone down! Up to 10% less horsepower is required for Aeromaster... and that piles up power savings *fast!*

Koppers engineering makes this big difference between Aeromaster and ordinary industrial fans. Blade profiles are an adaptation of high-speed, top-efficiency aircraft propeller blades for higher safety factor and improved anti-flutter performance.

Aeromaster Fans are available for any and every sizable industrial cooling application. Standard models range from 5 to 24 ft. dia., with 4, 6 or 8 blades per fan. Capacities up to 750,000 c.f.m. Engineering service furnished for special low pressure propeller fan installation. Sales engineers available in all principal U. S. cities, as well as in Europe.

KOPPERS COMPANY, INC.

MAIL COUPON TODAY for COMPLETE DETAILED INFORMATION

KOPPERS COMPANY, INC.
Aeromaster Fans
257 Scott St., Baltimore 3, Md.

KOPPERS

Gentlemen: Please send me detailed information on Aeromaster Fans for

.....
(name and type of equipment to be cooled)

Name.....

Title.....

Company.....

City.....Zone....State.....

No Water Hammer! No "Hunting!" DAVIS No. 60 FLOAT VALVE

The Davis No. 60 Float Valve, illustrated here, is unexcelled for dependable performance. It handles either hot or cold water with no "hunting," no "water-hammering." Opens easily against any pressure up to 125 p.s.i. and closes positively drip tight. No sticking; there is no internal packing to swell and cause excessive friction. Built in sizes ¼" to 12". Standard construction—composition disc, bronze trim. All bronze or stainless trim available. Contact your distributor or write.

No. 60

- Single seat; pilot stem
- Tight closing; non-sticking.
- Renewable disc; no internal packing.

DAVIS REGULATOR CO.
Established 1875
2539 So. Washtenaw Ave. Chicago 8, Ill.

WIRE MESH

Maybe it all *does* look pretty much the same at first glance. But when a firm has been making wire mesh for 70 years man and boy, there's bound to be a little more to it than meets the eye—a little more know-how in engineering and weaving, a little more quality in the product, a little more service and satisfaction for the user.

JELLIFF WIRE MESH is woven in all ductile metals
JELLIFF WIRE MESH is woven in all commercial weaves
JELLIFF WIRE MESH is woven in widths up to 72 inches
JELLIFF WIRE MESH is economical. Every foot runs true to the specifications.

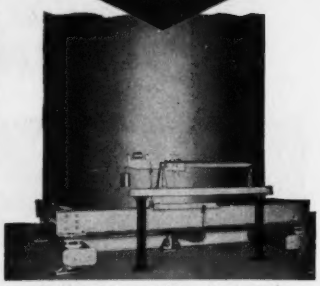
★ ★ ★ ★

JELLIFF WIRE MESH is a quality product and has been for 70 years. You can depend on it.

Write today for full details about JELLIFF WIRE MESH, JELLIFF WIRE MESH PRODUCTS, and JELLIFF'S CONSULTATION SERVICE on wire-mesh engineering. Address Department 15.

THE C. O. JELLIFF MFG. CORP.
SOUTHPORT CONNECTICUT

FOR WEIGHING CONTENTS OF TANKS and HOPPERS



Manufactured to special size—for your tank or hopper—vertical or horizontal

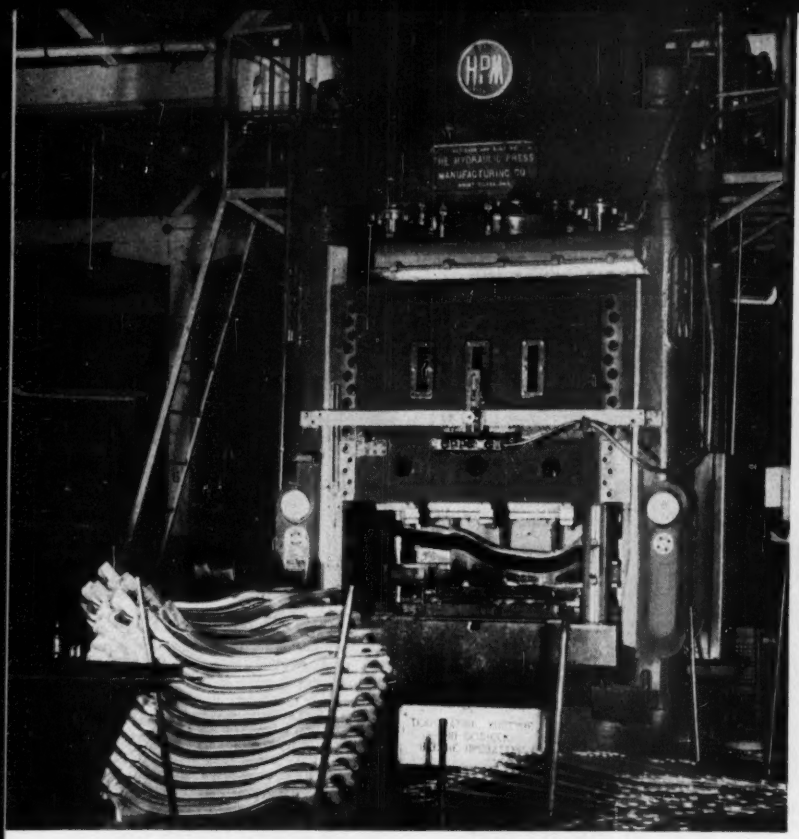
WINSLOW 150,000 LB. TANK SCALE

Can be furnished for use with cone shape or flat bottom tanks—with either direct reading weigh beam or ticket printing weigh beam. Ticket printing beam prints weights with 5 lb. or 10 lb. minimum graduation.

TYPE "A" RECORDING BEAM

This weighing equipment is in use by large and small industrial plants—throughout the United States—and specified by some of the country's largest consulting and construction engineering concerns.
Write for further information.

Winslow—
tank scales
Manufactured by
WINSLOW SCALE COMPANY
No. 25th Street - Terre Haute, Indiana



Send for this booklet...

Gain these benefits for your hydraulic operations

THE BIG 400-ton hydraulic press shown above is used to stamp out parts for farm machinery in a big midwest plant.

When the press was first put into operation, plant operators followed the recommendation of a Standard Oil lubrication specialist and used STANOIL Industrial Oil in the hydraulic system. In over four years of continuous hard service, there has been no lost time because of inefficient performance of the hydraulic oil.

Oil capacity of the system is approximately 9 barrels; only 2 barrels make-up per year has been required. The oil in this system has never been changed. It has been centrifuged once to remove moisture which accumulated over three years' operation. Periodic tests of oil samples have shown that STANOIL Industrial Oil has maintained its high lubricating quality. A recent analysis showed no increase in viscosity of the oil, no change in color, and a neutralization number of only 0.13 mg. KOH/gm.

STANOIL
TRADE MARK
Industrial Oil

You can rely on this unique many-purpose oil to give you the same clean, dependable service. Get the expert help of a Standard Oil lubrication specialist by phoning your local Standard Oil office.

Or write: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

See what Stanoil offers you...

You'll find the means to significant savings in this booklet. It describes the important qualities of STANOIL Industrial Oil and the resultant benefits which have made this multi-purpose oil the choice of midwest manufacturers for a host of important lubricating jobs. Discover how STANOIL will give you superior protection through its unique combination of six outstanding characteristics, including high stability and effective rust prevention. Find how STANOIL can simplify stock, storage, and inventory in your plant by replacing special-purpose oils in hydraulic systems, speed reducers, air compressors, machine tools, electric motors, auxiliary turbines, and a wide variety of circulating, bath, and bearing systems. Ask the Standard Oil lubrication specialist from your nearby Standard Oil office for this booklet, or write: Standard Oil Company (Indiana), 910 S. Michigan Ave., Chicago.

STANDARD OIL COMPANY **STANDARD** *(Indiana)*

No Water Hammer! No "Hunting!" DAVIS No. 60 FLOAT VALVE

The Davis No. 60 Float Valve, illustrated here, is unexcelled for dependable performance. It handles either hot or cold water with no "hunting," no "water-hammering." Opens easily against any pressure up to 125 p.s.i. and closes positively drip tight. No sticking; there is no internal packing to swell and cause excessive friction. Built in sizes ¼" to 12". Standard construction—composition disc, bronze trim. All bronze or stainless trim available. Contact your distributor or write.

No. 60

- Single seat; pilot stem
- Tight closing; non-sticking.
- Renewable disc; no internal packing.

DAVIS REGULATOR CO.
Established 1875
2539 So. Washtenaw Ave. Chicago 8, Ill.

WIRE MESH

Maybe it all *does* look pretty much the same at first glance. But when a firm has been making wire mesh for 70 years man and boy, there's bound to be a little more to it than meets the eye—a little more know-how in engineering and weaving, a little more quality in the product, a little more service and satisfaction for the user.

JELLIFF WIRE MESH is woven in all ductile metals
JELLIFF WIRE MESH is woven in all commercial weaves
JELLIFF WIRE MESH is woven in widths up to 72 inches
JELLIFF WIRE MESH is economical. Every foot runs true to the specifications.

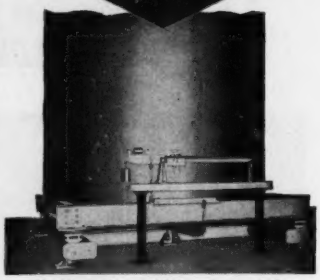
★ ★ ★ ★

JELLIFF WIRE MESH is a quality product and has been for 70 years. You can depend on it.

Write today for full details about JELLIFF WIRE MESH, JELLIFF WIRE MESH PRODUCTS, and JELLIFF'S CONSULTATION SERVICE on wire-mesh engineering. Address Department 15.

THE C. O. JELLIFF MFG. CORP.
DIPPING BASKETS · ELECTROMESH · RESISTANCE WIRE
WIRE MESH PARTS · WIRE CLOTH · STRAINERS · FILTERS
SOUTHPORT CONNECTICUT

FOR WEIGHING CONTENTS OF TANKS and HOPPERS



Manufactured to special size—for your tank or hopper—vertical or horizontal

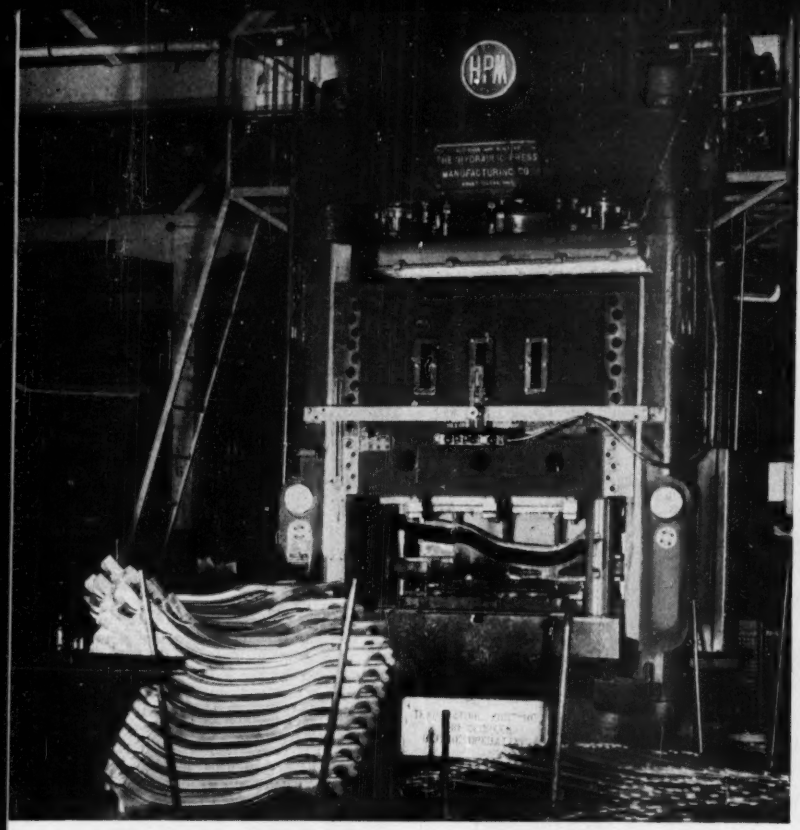
WINSLOW 150,000 LB. TANK SCALE

Can be furnished for use with cone shape or flat bottom tanks—with either direct reading weigh beam or ticket printing weigh beam. Ticket printing beam prints weights with 5 lb. or 10 lb. minimum graduation.

TYPE "A" RECORDING BEAM

This weighing equipment is in use by large and small industrial plants—throughout the United States—and specified by some of the country's largest consulting and construction engineering concerns.
Write for further information.

Winslow—
tank scales
Manufactured by
WINSLOW SCALE COMPANY
No. 25th Street — Terre Haute, Indiana



Send for this booklet...

Gain these benefits for your hydraulic operations

THE BIG 400-ton hydraulic press shown above is used to stamp out parts for farm machinery in a big midwest plant.

When the press was first put into operation, plant operators followed the recommendation of a Standard Oil lubrication specialist and used STANOIL Industrial Oil in the hydraulic system. In over four years of continuous hard service, there has been no lost time because of inefficient performance of the hydraulic oil.

Oil capacity of the system is approximately 9 barrels; only 2 barrels make-up per year has been required. The oil in this system has never been changed. It has been centrifuged once to remove moisture which accumulated over three years' operation. Periodic tests of oil samples have shown that STANOIL Industrial Oil has maintained its high lubricating quality. A recent analysis showed no increase in viscosity of the oil, no change in color, and a neutralization number of only 0.13 mg. KOH/gm.

STANOIL
TRADE MARK
Industrial Oil

You can rely on this unique many-purpose oil to give you the same clean, dependable service. Get the expert help of a Standard Oil lubrication specialist by phoning your local Standard Oil office.

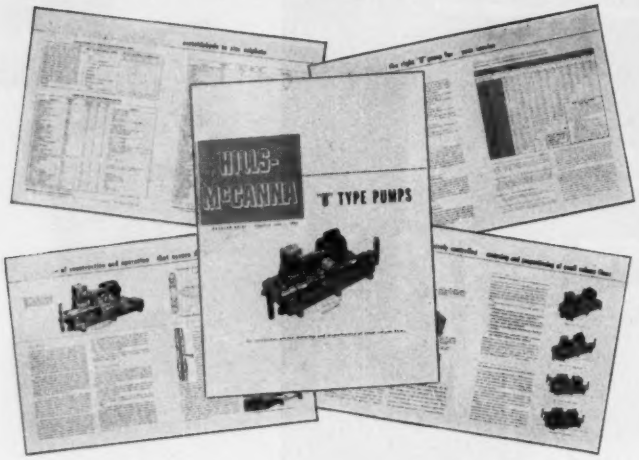
Or write: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

See what Stanoil offers you...

You'll find the means to significant savings in this booklet. It describes the important qualities of STANOIL Industrial Oil and the resultant benefits which have made this multi-purpose oil the choice of midwest manufacturers for a host of important lubricating jobs. Discover how STANOIL will give you superior protection through its unique combination of six outstanding characteristics, including high stability and effective rust prevention. Find how STANOIL can simplify stock, storage, and inventory in your plant by replacing special-purpose oils in hydraulic systems, speed reducers, air compressors, machine tools, electric motors, auxiliary turbines, and a wide variety of circulating, bath, and bearing systems. Ask the Standard Oil lubrication specialist from your nearby Standard Oil office for this booklet, or write: Standard Oil Company (Indiana), 910 S. Michigan Ave., Chicago.

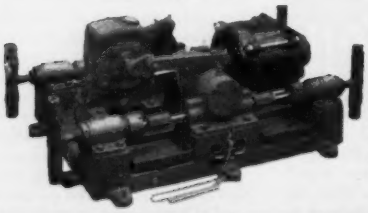
STANDARD OIL COMPANY **STANDARD** *(Indiana)*

Here's a handy guide to the selection of metering and proportioning pumps



In this new catalog and pump selection manual for Hills-McCanna "U" Type Metering and Proportioning Pumps is all the information, including prices, for the selection of exactly the right pump for handling over 300 substances. Clearly and concisely, this helpful booklet gives all the necessary information and specific recommendations to cover the vast majority of needs that can be filled with a Hills-McCanna "U" Type Pump.

If your operations involve the metering or proportioning of small volume flows, you will find this catalog a useful addition to your files. We will be pleased to send you a copy on request. HILLS-McCANNA COMPANY, 2341 W. Nelson St., Chicago 18, Illinois.

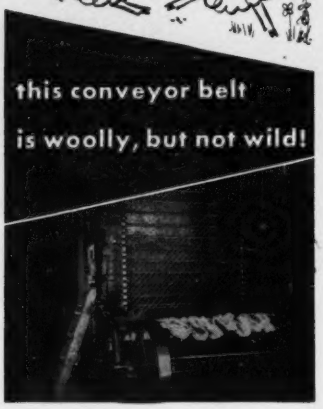


Hills-McCanna "U" Type Pumps are reciprocating, variable stroke, mechanical drive units with maximum capacities ranging from 0.10 to 24 gph. per feed. One, two, three and four feed assemblies are available. Operating pressures up to 5,000 psi. A four feed unit is shown at the left.

HILLS-McCANNA

metering and proportioning pumps

***Also Manufacturers of:* Saunders Patent Diaphragm Valves Force Feed Lubricators • Magnesium Alloy Sand Castings**



That's a true turnabout for this example of a specially designed Cambridge woven wire conveyor belt. This one carries wet, washed wool through a drying oven to remove moisture and washing chemicals from the fibre. There's no wild belt travel because the Cambridge Chain Drive design used here prevents the belt from riding from side to side across the pulleys . . . maintains straight belt movement.

Open mesh of the wire belt permits free, even heat circulation. All-metal construction gives longer belt life and lower maintenance costs.

Cambridge Chain Drive Attachment

Whether you're processing textile fibres, foods, chemicals, metal or ceramic products, a Cambridge woven wire conveyor belt can help you cut production costs and maintain product uniformity by combining movement with processing. But don't have the wool pulled over your eyes on conveyor belt design . . . be sure to call in your Cambridge field engineer for his recommendation on the proper—

CAMBRIDGE WOVEN WIRE CONVEYOR BELT —any metal or alloy, mesh or weave.

Write direct or look under "Belting-Mechanical" in your classified telephone directory.

FREE BELT MANUAL contains information on conveyor and belt design and specifications, metallurgical data and belt maintenance. Write for your copy today.

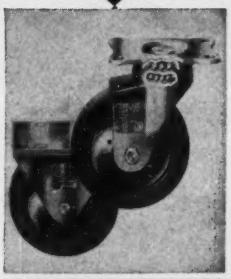
The Cambridge Wire Cloth Co.

Dept. G • Cambridge 7, Md.

WIRE CLOTH | METAL CONVEYOR BELTS | SPECIAL METAL FABRICATIONS

OFFICES IN PRINCIPAL INDUSTRIAL CITIES

Pre-tested for Performance



Darnell CASTERS

If you want maximum floor protection, economy and efficiency Demand Darnell Dependability...Made to give an extra long life of satisfactory service . . . . .

A TYPE AND SIZE FOR EVERY PURPOSE

★

DARNELL CORP., LTD.
DOWNEY, (Los Angeles County) CALIF.

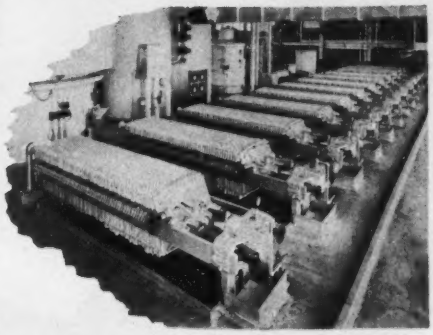
60 Walker Street, New York 13, N.Y.
36 North Clinton, Chicago 6, Illinois

That's a Whale of a Lot of Filtration

Year after year the process industries of America install an average of 200,000 square feet of New Shriver Filter Press Capacity

because

SHRIVER'S Got It Every Way



Whether it's adhesives or amines, electrolytes or emulsions, casein or colors, mercaptans or mucilage, resins or rosin, or hundreds of other process materials that need improvement through filtration—the Shriver Filter Press can do the job better, at lower over-all cost. It's more versatile, more economical—a sound investment in every way.

Straight Facts Prove Shriver Filter Presses

- Are lowest in cost per sq. ft. of filtering area
- Filter any material, even thick or viscous
- Recover solids, reasonably dry, firm, easy to handle
- Wash, extract, thicken, steam out, melt, redissolve
- Operate at any pressure or temperature
- Clarify, bleach, decolorize, deodorize, germproof
- May be made of any metal, wood, rubber, plastic

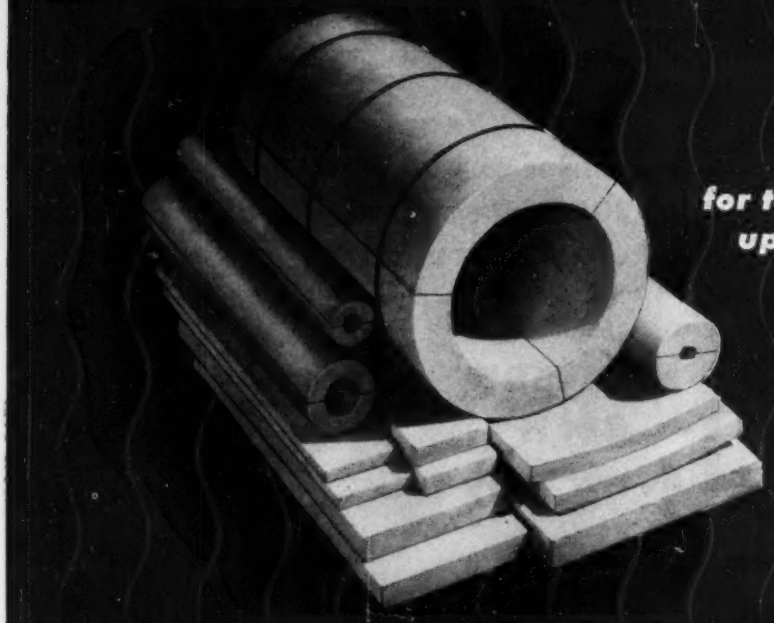
FIRST IN PRESSURE FILTRATION

Get the Facts

Get this New Catalog

T. SHRIVER & COMPANY, Inc.
802 HAMILTON ST., HARRISON, N. J.

Extra Advantages at No Extra Cost



—When You Use Kaylo Insulation!

For example, Kaylo Heat Insulation reduces inventory requirements because:

1. Wide effective temperature range —up to 1200° F.—eliminates the need for combination coverings in nearly all operating conditions.

2. Simplified Dimensional Standards allow nesting.

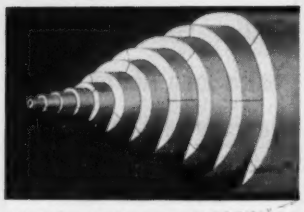
3. Unmatched selection of shapes and sizes reduces the number of pieces required per job.

Kaylo Heat Insulation reduces installation costs because:

4. The material is lightweight, strong and easily handled.

5. It is easy to cut and fit with standard tools.

Kaylo Heat Insulation is a hydrous calcium silicate—the heat-saving material that is revolutionizing insulation practice with its outstanding combination of advantages. Get all of the facts now.



Simplified Dimensional Standards mean that O. D.'s of insulation correspond to O. D.'s of standard pipes, assuring proper fit for nesting, when necessary. With this system of snug nesting, Kaylo Heat Insulation assures fits for all operating conditions, requires less items—reduces inventory stocks.

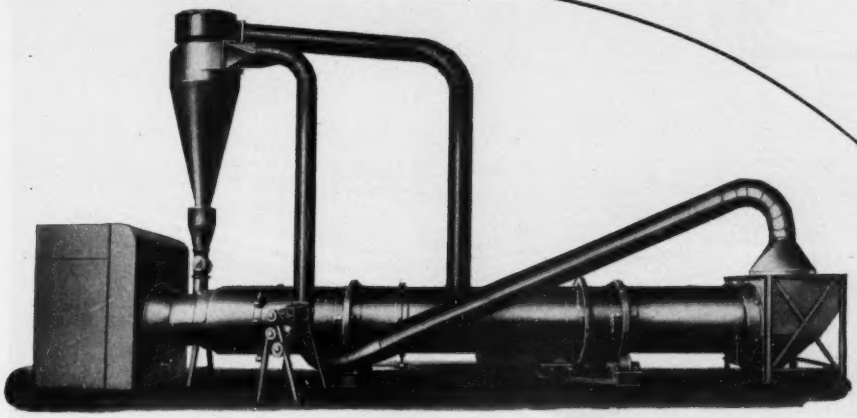
WRITE FOR FREE BOOK—"Kaylo Heat Insulation." Address: Dept. N-261, Owens-Illinois Glass Company, Kaylo Division, Toledo 1, Ohio.

KAYLO® ... first in calcium silicate

...pioneered by OWENS ILLINOIS Glass Company

MAIN OFFICE: TOLEDO 1, OHIO — KAYLO SALES OFFICES: ATLANTA • BOSTON • CHICAGO • CINCINNATI • CLEVELAND • DETROIT HOUSTON • MINNEAPOLIS • NEW YORK • OKLAHOMA CITY • PHILADELPHIA • PITTSBURGH • ST. LOUIS • WASHINGTON

"...first look at the STANDARD-HERSEY DRYER"



Modern STANDARD HERSEY Starch Dryer

for greater drying profits

Here is another case history where Standard-Hersey precision engineering is helping to ring the cash register.

The successful experience of the Presque Isle Starch Company with Standard-Hersey equipment is being duplicated by leading manufacturers throughout the country—drying hundreds of different products.

We have, or can find, a solution for *your* drying problem, too. Let Standard-Hersey's 80 years of engineering know-how go to work for you. Standard offers unequaled experience in the dryer field. Its facilities for pre-testing products and designing, engineering and fabricating drying equipment are unsurpassed in the world today.

STANDARD-HERSEY DRYER doubles drying production for Potato Starch Manufacturer

"Standard Steel Corporation,
Los Angeles 58, California.
Gentlemen:

We were one of the first Potato Starch Manufacturers in Maine to convert from the old type dry house method of drying, to the use of the Hersey Steel Dryer.

Our drying production doubled when we installed the Standard-Hersey Starch Dryer, our labor cost went down, and the quality of our starch was greatly improved.

We can strongly recommend to any interested party planning a change in their starch drying method, to first look at the Standard-Hersey Dryer.

Yours very truly,
PRESQUE ISLE STARCH COMPANY
(Signed) G. F. Washburn, Jr."

STANDARD HERSEY Dryers

SEND FOR new, illustrated STANDARD-HERSEY Dryer Bulletin No. 508. Describes the more than 30 types of dryers available in all commercial sizes for every process industry need.

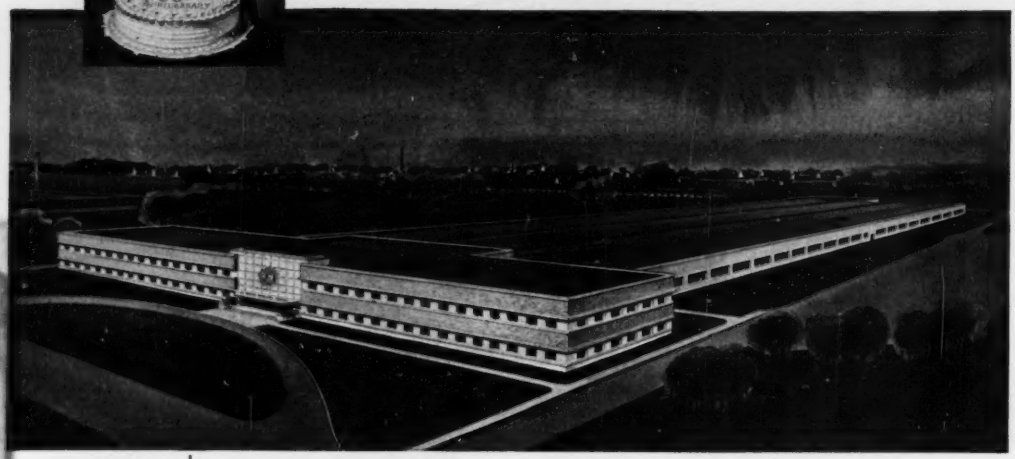
STANDARD 50 YEARS 1902-1952

STANDARD STEEL CORPORATION

5045 Boyle Ave., Los Angeles 58 • 123-45 Newbury St., Boston 16

Commemorating our 60th Anniversary

THE POWERS REGULATOR COMPANY



New Factory and General Office Building: **3400 Oakton Street, Skokie, Illinois**

World's Most Modern Factory Producing Automatic Temperature and Humidity Control

. . . to meet the greatly increased demand for POWERS products and to give you better controls, better deliveries and better values . . . these advantages are possible with our large new plant and modern production facilities. With an enlarged engineering and production staff, plus 60 years experience in heating, ventilating, air conditioning and process control, we believe we can be of greater service than ever before to our many friends who have contributed to our success.

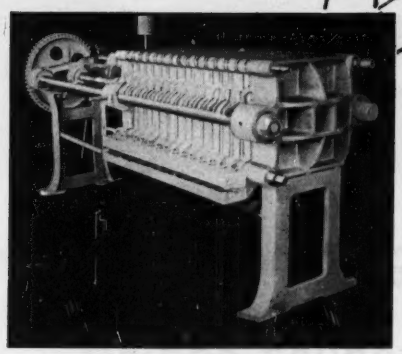
WILLIAM PENN POWERS . . . with his invention of the first all pneumatic system of temperature control and gradual acting vapor disc thermostat made an invaluable contribution to the modern science of heating, air conditioning and industrial process control.

POWERS CONTROL — TEMPERATURE AND HUMIDITY — 60th ANNIVERSARY — 1891 1951

Offices in Over 50 Cities. See Your Phone Book.

Chicago 13, Ill., 3819 N. Ashland Avenue • New York 17, N. Y., 231 East 46th Street
Los Angeles 5, Cal., 1808 West 8th Street • Toronto, Ontario, 195 Spadina Avenue
Mexico, D. F., Apartado 63 Bis. • Honolulu 3, Hawaii, P. O. 2755—450 Piikoi at Kona (a55)

it's a tradition



AND QUALITY IS A TRADITION WITH THE SPERRY FILTER PRESS!

Sperry has pioneered and developed the Filter press that today ranks as America's most widely used filter. This definite acceptance of Sperry engineering reflects the *tradition of quality* that for over a half century has set the standard for all Sperry equipment . . . as exemplified in these advantages of the Sperry Filter Press:

Greater Flexibility: Handles any kind of filterable mixture . . . requires less floor space . . . operates on low, medium or high pressure . . . can handle hot liquids without vaporizing . . . Uses filter paper or pulp, wire, wool, asbestos, glass, vinyon and other kinds of simple filter cloths.

Greater Performance: Produces maximum clarity . . . makes the driest cakes . . . can separate emulsions . . . delivers filtrate to higher level than filter . . . leak proof construction . . . can deliver cake in slab form . . . thoroughly washes the cake.

Greater Economy: Low first cost . . . low upkeep . . . low installation cost . . . low depreciation . . . long life.

For specific data regarding your own filtration problem, consult Sperry. Send samples of your material for test run.

SPERRY FILTER BASES

All types . . . all sizes. Plain or punched to your specifications. Besides cotton and paper, bases are furnished in wool, synthetics, glass and woven metals.

D. R. SPERRY & COMPANY

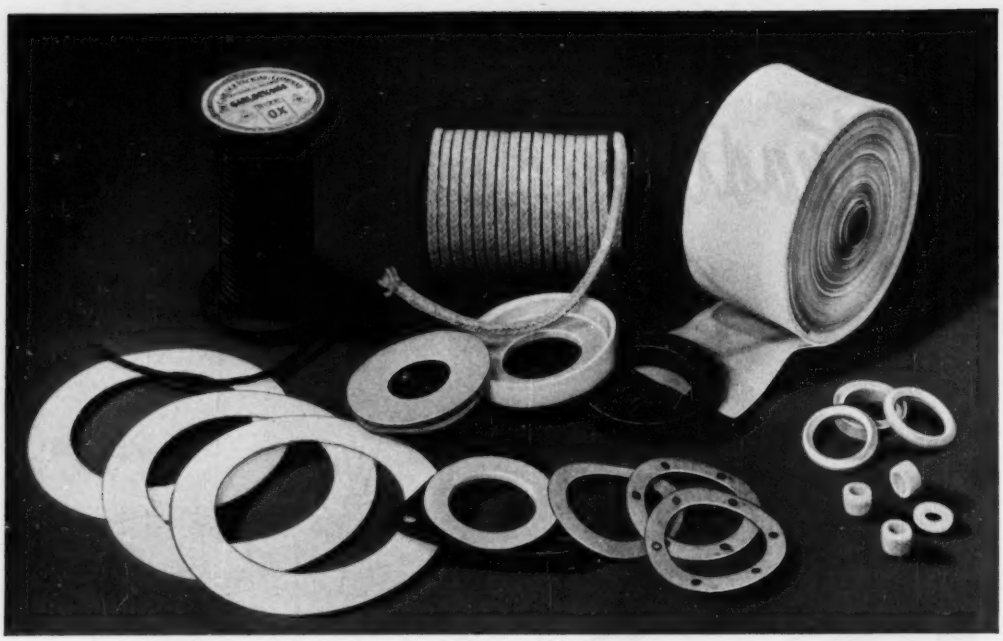
BATAVIA, ILLINOIS

Filtration Engineers for over 60 years

Eastern Sales Representative: H. E. Jacoby, M.E.
205 E. 42nd St., New York 17, N. Y.; Phone MUrray Hill 4-3581

Western Sales Representative: B. M. Pilhashy
833 Merchants Exchange Bldg., San Francisco 4, Calif.
Phone DO 2-0375

SPERRY FILTER PRESSES



These Teflon* Packings and Gaskets

Solve the problem of sealing against acids, organic solvents, and alkalies

Garlock packings and gaskets made of TEFLON are entirely unaffected by acids and are completely resistant to all alkali solutions and organic solvents, such as:

Concentrated Sulphuric, Chromic, Nitric and Hydrofluorine Acids	Hydrogen Fluoride
	Concentrated Hydrogen Peroxide
Bromine	Oxygen
Chlorine	Sulphuric Chloride
Fluorine	Sulphur Oxychloride

TEFLON packings and gaskets are recommended for use at operating temperatures from below −90° F. up to 500° F. Within this wide temperature range these packings and gaskets retain their inherent toughness, have a low coefficient of friction, and do not react with metals of construction.

Wherever resistance to chemicals is required, specify GARLOCK'S TEFLON packings for use on valves, pump rods or shafts; TEFLON gaskets for all types of flanged joints.

We can mold, machine or form TEFLON in a wide variety of shapes and sizes. When you need finished TEFLON parts contact Garlock.

Write for TEFLON Catalog today!

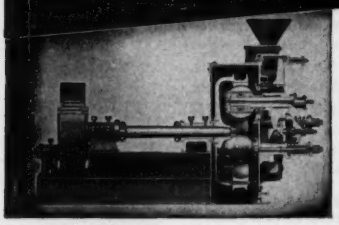
THE GARLOCK PACKING COMPANY
PALMYRA, NEW YORK
In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

*THE DU PONT COMPANY'S TRADEMARK

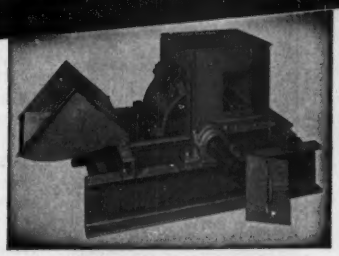
GARLOCK

PACKINGS, GASKETS, OIL SEALS, MECHANICAL SEALS, RUBBER EXPANSION JOINTS

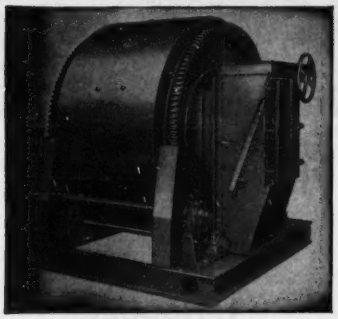
Step-up Production Lower Preparation Costs with STURTEVANT EQUIPMENT



RING ROLL MILL — for medium and fine reduction of hard or soft materials (10 to 200 mesh). Open-door accessibility for easy cleaning. Available in many sizes and capacities.

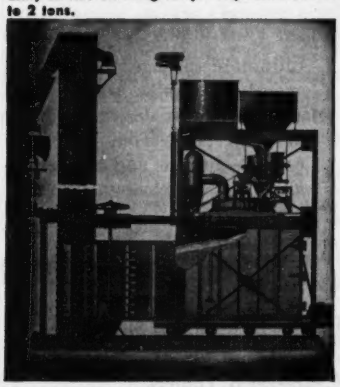


TAILINGS ROTARY PULVERIZER — increases output of fertilizer tailings . . . will not clog . . . leaves no daily accumulation of unground pellets. Capacities up to 25 tons per hour.

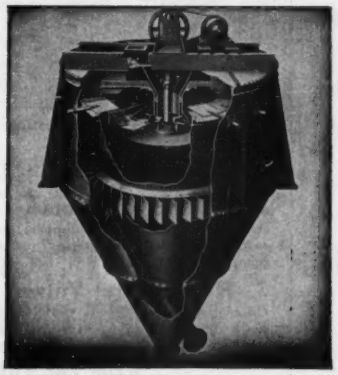


DRY BATCH MIXERS — 4-way mixing action mixes two or more ingredients into an inseparable, homogeneous mass. Open door accessibility makes cleaning easy. Capacities ¼ ton to 2 tons.

MOTO-VIBRO SCREENS — screen everything screenable. Open and closed models with or without feeders. Many types and sizes . . . screens from ½" to 60 mesh.



DEN AND EXCAVATOR — speeds processing of superphosphates. Easily operated by two men . . . produces 16 to 40 tons per batch and up to 480 tons per day of superior fertilizer free from lumps.



AIR SEPARATOR — for finest separation of materials. Capacities from ¼ ton to 50 tons per hour in fineness of 40 to 325 mesh and finer. Increases production of finer, cuts power consumption costs.

Sturtevant Processing Equipment . . . Grinders, mixers, separators, screens, etc. . . . can help you *reduce* today's high manufacturing costs by increasing both machine and operator output, lowering production costs, assuring high quality products.

Records in all types of industries — chemical, plastics, ceramics, cement, food, construction — prove that this equipment works dependably day in, day out with little, if any, maintenance.

Used individually or linked together in proper sequence, they do the job faster and easier than other types . . . handle a larger variety of work.

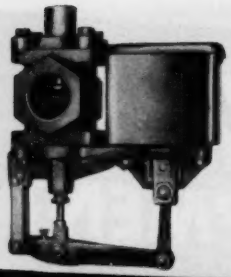
It will pay you to investigate Sturtevant Processing Equipment for your plant. There is a size and type of machine that will meet your requirements. Write for information.

STURTEVANT MILL COMPANY

100 CLAYTON STREET
BOSTON 22, MASSACHUSETTS

Designers and Manufacturers of:

CRUSHERS • GRINDERS • SEPARATORS
CONVEYORS • MECHANICAL DENS
and EXCAVATORS • ELEVATORS
MIXERS



JOHNSON
Direct Acting
SOLENOID VALVE

HERE'S a heavy duty, wide-range valve for all automatic, or remote, flow control. Has no pilot valves or auxiliary pistons; handles differential pressures to 150 lbs. in some sizes, temperatures to 400° F; provides immediate response. Available with stainless steel valve and seat or Jenkins disc; for normally open or normally closed service; sizes from ½" to 3".

Where can you use it?
Write for Bulletin. V.

The Johnson Corporation
848 Wood St., Three Rivers, Mich.

TALC
...IN EVERY GRADE
MOST COMPLETE RANGE OF SELECTION

Call on Whittaker
"The Talc House"

TRUE TALCS—Best for cosmetics, pharmaceutics, food processing.
SOFT PARTICLE TALCS — For textile industry, ceramic manufacturers, dusting powders.
FIBROUS TALCS — For paints and ceramic whiteware.
HIGH IRON CONTENT TALCS — Widely used in the paint, rubber, foundry and similar industries.

WHITTAKER HAS A TALC FOR EVERY MANUFACTURING NEED

WHITTAKER CLARK & DANIELS, INC.
Processing Dept. A
260 West Broadway New York 13, N. Y.
Canadian Representative:
Richardson Agencies, Ltd. 434 King Street, W. Toronto

SAVE MONEY!
STOP COSTLY WORK CLOTHES REPLACEMENTS

Worklon Industrial Apparel
RESIST ACIDS AND CHEMICALS
Outwear cotton and wool 13 to 1
they're DuPont Orlon
new acrylic fiber; fabric by Travis

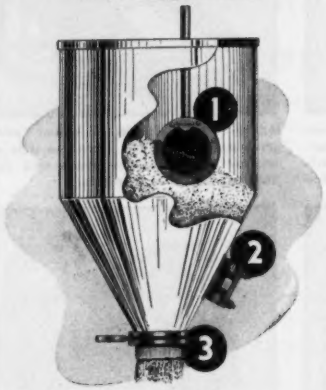
Lab tests prove Worklon clothes will:
- Resist acid and chemical deterioration
- Resist mildew, sunlight, grease, abrasion, Ultra-Violet rays
- Launder and dry quickly, retain crease with little or no ironing

WORKLON®

WORKLON, INC.
Dept. C-3
253 West 28th St., New York 1, N.Y.
Gentlemen:
Please send FREE CATALOG of Industrial Apparel of Orlon . . . a DuPont acrylic fabric.
Firm Name_____
Address_____
City_____ State_____
Dept._____

for Complete Hopper Efficiency

SYNTRON



1. Hopper Level Switches
Eliminate spillage and shortage of materials. Automatically maintains desired levels of materials—from fine to coarse—in bins and hoppers. Control feeding.

2. Electric Vibrators
Assure free-flowing bins, hoppers and chutes. Eliminate arching and plugging of materials without hammering and rodding that damages equipment and wastes manpower.

3. Flow Control Valves
Control flow of bulk materials from bins, hoppers and chutes. Rotating control lever increases or decreases opening of flexible iris type diaphragm and flow of material without jamming or clogging.

Write For FREE Illustrated Folders

SYNTRON COMPANY
610 Lexington Avenue Homer City, Penna.

NEW SUBSCRIPTION ORDER

3 years of CHEMICAL ENGINEERING for $5* ☐

☐ I will pay when you bill me. ☐ I enclose remittance.

☐ 2 YEARS FOR $4* OR ☐ 1 YEAR FOR $3*

Name _____ Position _____

Home Address _____

City _____ Postal Zone _____ State _____

Company _____

*Above rates are for U. S. and U. S. possessions ONLY.

CANADA: $4 ☐ 1 year.....$6 ☐ 2 years.....$8 ☐ 3 years (payable in Canadian or U. S. funds.)
LATIN AMERICA: $15 ☐ 1 year.....$25 ☐ 2 years.....$30 ☐ 3 years.
OTHER COUNTRIES: $20 ☐ 1 year.....$30 ☐ 2 years.....$40 ☐ 3 years.

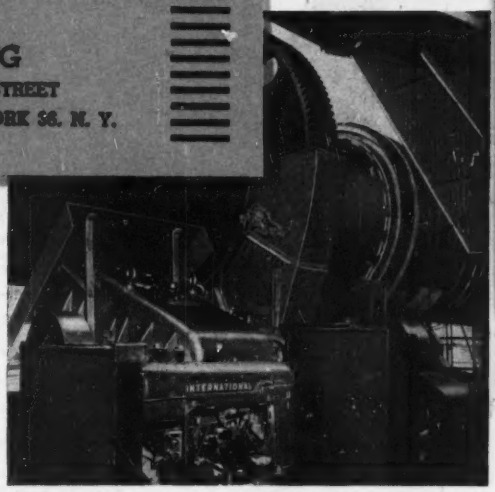
7-52

FIRST CLASS
PERMIT No. 64
(Sec. 34.9, P.L.&R.)
NEW YORK, N. Y.

BUSINESS REPLY CARD
No Postage Stamp Necessary If Mailed In The United States

4¢ POSTAGE WILL BE PAID BY —

McGRAW-HILL PUBLISHING CO.
CHEMICAL ENGINEERING
330 WEST 42nd STREET
NEW YORK 36, N. Y.



but also embodies every modern feature to assure efficient, economical operation. The very heavy all-welded steel shell is mounted on our latest-type supporting roller and thrust bearings; all of which are automatically lubricated and easily adjusted to compensate for wear or moderate misalignment. Main drive and auxiliary drive both have an ample margin of power over any probable requirement and are as fully enclosed as possible, to promote cleanliness and safety. Other features, specified by the Warner Company's experienced engineers and production executives, assure maximum capacity and minimum fuel consumption under their particular operating conditions.

Detailed information regarding Vulcan Rotary Kilns for lime plants, cement plants, and other modern applications is given in our 28-page, fully illustrated, bulletin No. A-442. Write for it if you can use it to advantage.

Auxiliary Drive (above) is from gasoline engine through Morse clutch-coupling and V-belts to same enclosed speed reducer as for main drive.

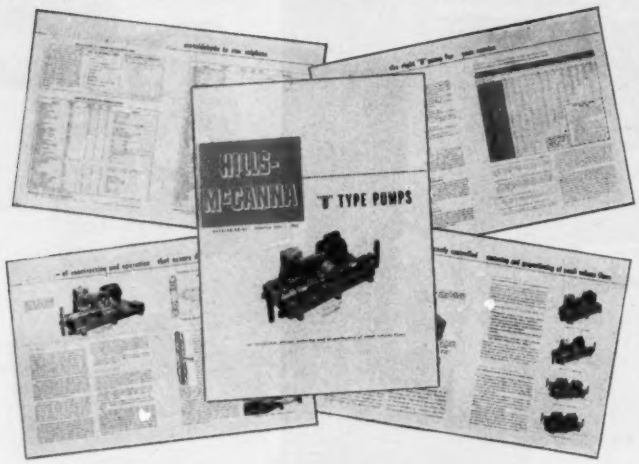
VULCAN IRON WORKS

Established 1849

Main Office and Works **WILKES-BARRE, PA.,** New York Office 50 Church

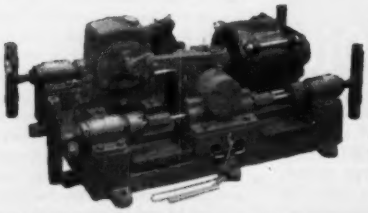
Rotary Kilns, Coolers and Dryers	Double-Roll Briquetting Machines	Heavy-Duty Electric Hoists	Steam Locomotives
Rotary Retorts, Calciners, Etc.	Open-Hearth Steel Castings	Self-Contained Electric Hoists	Diesel and Gasoline Locomotives
Improved Vertical Lime Kilns	Steel-Plate Fabrication	Scraper-Loading Hoists	Diesel-Electric Locomotives
Automatic Quick-Lime Hydrators	Shaking-Chute and Chain Conveyors	Cast-Steel Sheaves and Gears	Electric Locomotives and Larrys

Here's a handy guide to the selection of metering and proportioning pumps



In this new catalog and pump selection manual for Hills-McCanna "U" Type Metering and Proportioning Pumps is all the information, including prices, for the selection of exactly the right pump for handling over 300 substances. Clearly and concisely, this helpful booklet gives all the necessary information and specific recommendations to cover the vast majority of needs that can be filled with a Hills-McCanna "U" Type Pump.

If your operations involve the metering or proportioning of small volume flows, you will find this catalog a useful addition to your files. We will be pleased to send you a copy on request. HILLS-McCANNA COMPANY, 2341 W. Nelson St., Chicago 18, Illinois.

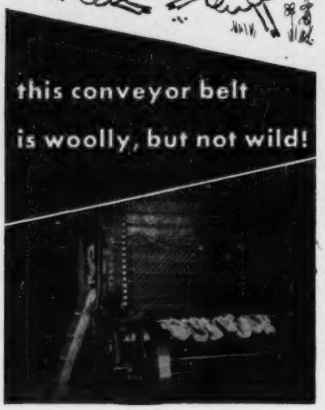


Hills-McCanna "U" Type Pumps are reciprocating, variable stroke, mechanical drive units with maximum capacities ranging from 0.10 to 24 gph. per feed. One, two, three and four feed assemblies are available. Operating pressures up to 5,000 psi. A four feed unit is shown at the left.

HILLS-McCANNA

metering and proportioning pumps

Also Manufacturers of: Saunders Patent Diaphragm Valves Force Feed Lubricators • Magnesium Alloy Sand Castings



That's a true turnabout for this example of a specially designed Cambridge woven wire conveyor belt. This one carries wet, washed wool through a drying oven to remove moisture and washing chemicals from the fibre. There's no wild belt travel because the Cambridge Chain Drive design used here prevents the belt from riding from side to side across the pulleys . . . maintains straight belt movement.

Open mesh of the wire belt permits free, even heat circulation. All-metal construction gives longer belt life and lower maintenance costs.

Cambridge Chain Drive Attachment

Whether you're processing textile fibres, foods, chemicals, metal or ceramic products, a Cambridge woven wire conveyor belt can help you cut production costs and maintain product uniformity by combining movement with processing. But don't have the wool pulled over your eyes on conveyor belt design . . . be sure to call in your Cambridge field engineer for his recommendation on the proper—

CAMBRIDGE WOVEN WIRE CONVEYOR BELT —any metal or alloy, mesh or weave.

Write direct or look under "Belting-Mechanical" in your classified telephone directory.

FREE BELT MANUAL contains information on conveyor and belt design and specifications, metallurgical data and belt maintenance. Write for your copy today.

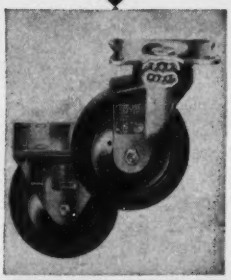
The Cambridge Wire Cloth Co.

Dept. G • Cambridge 7, Md.

WIRE CLOTH | METAL CONVEYOR BELTS | SPECIAL METAL FABRICATIONS

OFFICES IN PRINCIPAL INDUSTRIAL CITIES

Pre-tested for Performance



Darnell CASTERS

If you want maximum floor protection, economy and efficiency Demand Darnell Dependability...Made to give an extra long life of satisfactory service . . . . .

A TYPE AND SIZE FOR EVERY PURPOSE

DARNELL CORP., LTD.
DOWNEY, (Los Angeles County) CALIF.

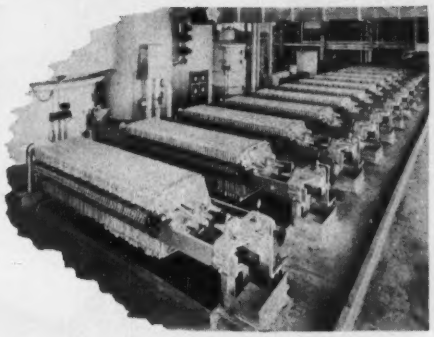
60 Walker Street, New York 13, N.Y.
36 North Clinton, Chicago 6, Illinois

That's a Whale of a Lot of Filtration

Year after year the process industries of America install an average of 200,000 square feet of New Shriver Filter Press Capacity

because

SHRIVER'S Got It Every Way



Whether it's adhesives or amines, electrolytes or emulsions, casein or colors, mercaptans or mucilage, resins or rosin, or hundreds of other process materials that need improvement through filtration—the Shriver Filter Press can do the job better, at lower over-all cost. It's more versatile, more economical—a sound investment in every way.

Straight Facts Prove Shriver Filter Presses

- Are lowest in cost per sq. ft. of filtering area
- Filter any material, even thick or viscous
- Recover solids, reasonably dry, firm, easy to handle
- Wash, extract, thicken, steam out, melt, redissolve
- Operate at any pressure or temperature
- Clarify, bleach, decolorize, deodorize, germproof
- May be made of any metal, wood, rubber, plastic

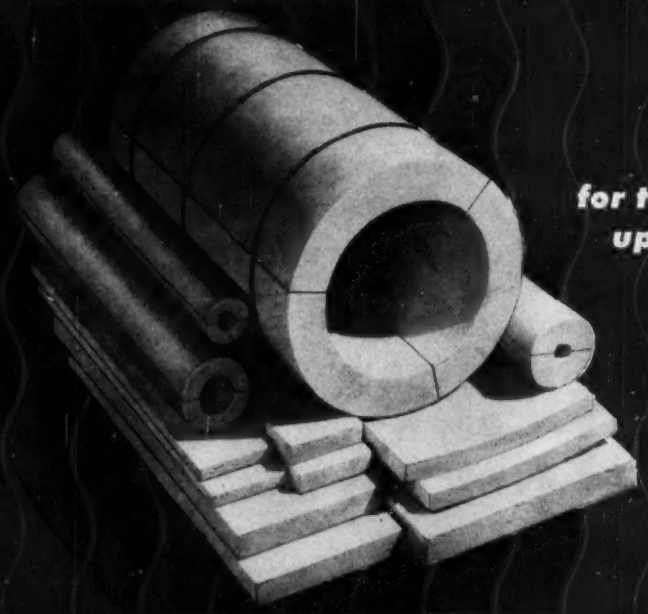
FIRST IN PRESSURE FILTRATION

Get the Facts

Get this New Catalog

T. SHRIVER & COMPANY, Inc.
802 HAMILTON ST., HARRISON, N. J.

Extra Advantages at No Extra Cost



for temperatures up to 1200° F.

—When You Use Kaylo Insulation!

For example, Kaylo Heat Insulation reduces inventory requirements because:

1. Wide effective temperature range —up to 1200° F.—eliminates the need for combination coverings in nearly all operating conditions.

2. Simplified Dimensional Standards allow nesting.

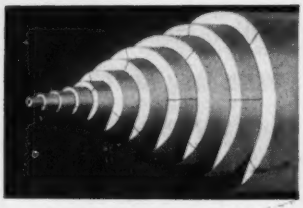
3. Unmatched selection of shapes and sizes reduces the number of pieces required per job.

Kaylo Heat Insulation reduces installation costs because:

4. The material is lightweight, strong and easily handled.

5. It is easy to cut and fit with standard tools.

Kaylo Heat Insulation is a hydrous calcium silicate—the heat-saving material that is revolutionizing insulation practice with its outstanding combination of advantages. Get all of the facts now.



Simplified Dimensional Standards mean that O. D.'s of insulation correspond to O. D.'s of standard pipes, assuring proper fit for nesting, when necessary. With this system of snug nesting, Kaylo Heat Insulation assures fits for all operating conditions, requires less items—reduces inventory stocks.

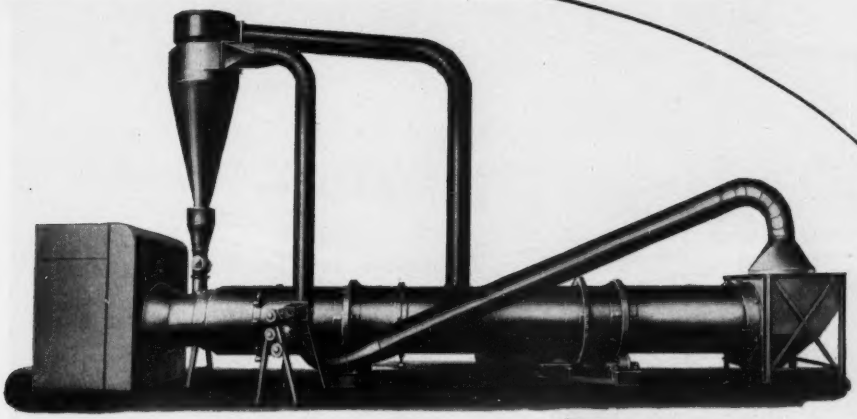
WRITE FOR FREE BOOK—"Kaylo Heat Insulation." Address: Dept. N-261, Owens-Illinois Glass Company, Kaylo Division, Toledo 1, Ohio.

KAYLO® . . . first in calcium silicate

. . . pioneered by OWENS ILLINOIS Glass Company

MAIN OFFICE: TOLEDO 1, OHIO — KAYLO SALES OFFICES: ATLANTA • BOSTON • CHICAGO • CINCINNATI • CLEVELAND • DETROIT HOUSTON • MINNEAPOLIS • NEW YORK • OKLAHOMA CITY • PHILADELPHIA • PITTSBURGH • ST. LOUIS • WASHINGTON

"...first look at the STANDARD-HERSEY DRYER"



Modern STANDARD HERSEY Starch Dryer

for greater drying profits

Here is another case history where Standard-Hersey precision engineering is helping to ring the cash register.

The successful experience of the Presque Isle Starch Company with Standard-Hersey equipment is being duplicated by leading manufacturers throughout the country—drying hundreds of different products.

We have, or can find, a solution for *your* drying problem, too. Let Standard-Hersey's 80 years of engineering know-how go to work for you. Standard offers unequaled experience in the dryer field. Its facilities for pre-testing products and designing, engineering and fabricating drying equipment are unsurpassed in the world today.

STANDARD-HERSEY DRYER doubles drying production for Potato Starch Manufacturer

"Standard Steel Corporation,
Los Angeles 58, California.
Gentlemen:

We were one of the first Potato Starch Manufacturers in Maine to convert from the old type dry house method of drying, to the use of the Hersey Steel Dryer.

Our drying production doubled when we installed the Standard-Hersey Starch Dryer, our labor cost went down, and the quality of our starch was greatly improved.

We can strongly recommend to any interested party planning a change in their starch drying method, to first look at the Standard-Hersey Dryer.

Yours very truly,
PRESQUE ISLE STARCH COMPANY
(Signed) G. F. Washburn, Jr."

STANDARD HERSEY *Dryers*

SEND FOR new, illustrated STANDARD-HERSEY Dryer Bulletin No. 508. Describes the more than 30 types of dryers available in all commercial sizes for every process industry need.

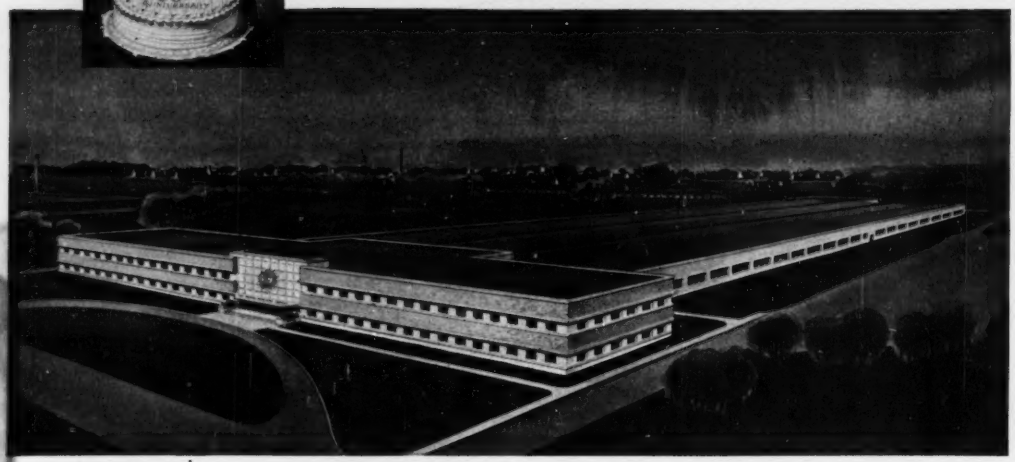
STANDARD 50 YEARS

STANDARD STEEL CORPORATION

5045 Boyle Ave., Los Angeles 58 • 123-45 Newbury St., Boston 16

Commemorating our 60th Anniversary

THE POWERS REGULATOR COMPANY



New Factory and General Office Building: **3400 Oakton Street, Skokie, Illinois**

World's Most Modern Factory Producing Automatic Temperature and Humidity Control

. . . to meet the greatly increased demand for POWERS products and to give you better controls, better deliveries and better values . . . these advantages are possible with our large new plant and modern production facilities. With an enlarged engineering and production staff, plus 60 years experience in heating, ventilating, air conditioning and process control, we believe we can be of greater service than ever before to our many friends who have contributed to our success.

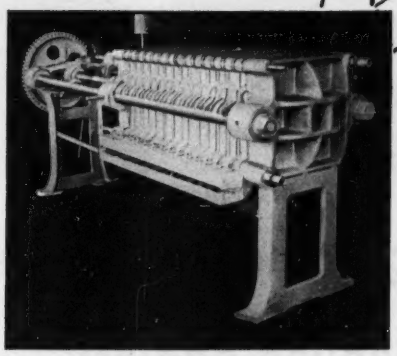
WILLIAM PENN POWERS
. . . with his invention of the first all pneumatic system of temperature control and gradual acting vapor disc thermostat made an invaluable contribution to the modern science of heating, air conditioning and industrial process control.

Offices in Over 50 Cities. See Your Phone Book.

Chicago 13, Ill., 3819 N. Ashland Avenue • New York 17, N. Y., 231 East 46th Street
Los Angeles 5, Cal., 1808 West 8th Street • Toronto, Ontario, 195 Spadina Avenue
Mexico, D. F., Apartado 63 Bis. • Honolulu 3, Hawaii, P. O. 2755—450 Piikoi at Kona

(a55)

it's a tradition



AND QUALITY IS A TRADITION WITH THE SPERRY FILTER PRESS!

Sperry has pioneered and developed the Filter press that today ranks as America's most widely used filter. This definite acceptance of Sperry engineering reflects the *tradition of quality* that for over a half century has set the standard for all Sperry equipment . . . as exemplified in these advantages of the Sperry Filter Press:

Greater Flexibility: Handles any kind of filterable mixture . . . requires less floor space . . . operates on low, medium or high pressure . . . can handle hot liquids without vaporizing . . . Uses filter paper or pulp, wire, wool, asbestos, glass, vinyon and other kinds of simple filter cloths.

Greater Performance: Produces maximum clarity . . . makes the driest cakes . . . can separate emulsions . . . delivers filtrate to higher level than filter . . . leak proof construction . . . can deliver cake in slab form . . . thoroughly washes the cake.

Greater Economy: Low first cost . . . low upkeep . . . low installation cost . . . low depreciation . . . long life.

For specific data regarding your own filtration problem, consult Sperry. Send samples of your material for test run.

SPERRY FILTER BASES

All types . . . all sizes. Plain or punched to your specifications. Besides cotton and paper, bases are furnished in wool, synthetics, glass and woven metals.

D. R. SPERRY & COMPANY

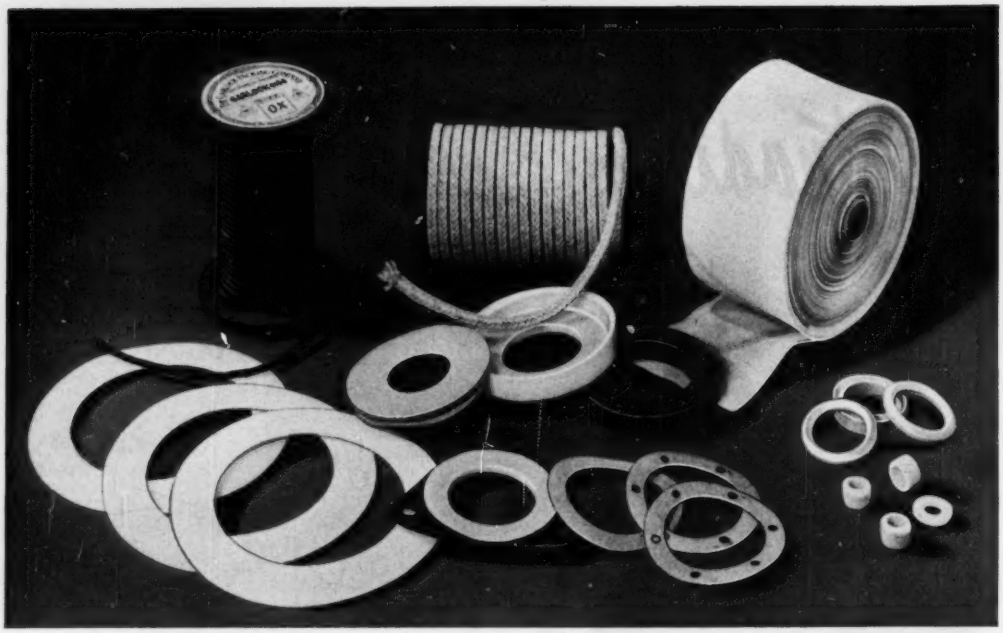
BATAVIA, ILLINOIS

Filtration Engineers for over 60 years

Eastern Sales Representative: H. E. Jacoby, M.E.
205 E. 42nd St., New York 17, N. Y.; Phone MUrray Hill 4-3581

Western Sales Representative: B. M. Pilhashy
833 Merchants Exchange Bldg., San Francisco 4, Calif.
Phone DO 2-0375

SPERRY FILTER PRESSES



These Teflon* Packings and Gaskets

Solve the problem of sealing against acids, organic solvents, and alkalies

Garlock packings and gaskets made of TEFLON are entirely unaffected by acids and are completely resistant to all alkali solutions and organic solvents, such as:

Concentrated Sulphuric, Chromic, Nitric and Hydrofluorine Acids	Hydrogen Fluoride
	Concentrated Hydrogen Peroxide
Bromine	Oxygen
Chlorine	Sulphuric Chloride
Fluorine	Sulphur Oxychloride

TEFLON packings and gaskets are recommended for use at operating temperatures from below −90° F. up to 500° F. Within this wide temperature range these packings and gaskets retain their inherent toughness, have a low coefficient of friction, and do not react with metals of construction.

Wherever resistance to chemicals is required, specify GARLOCK'S TEFLON packings for use on valves, pump rods or shafts; TEFLON gaskets for all types of flanged joints.

We can mold, machine or form TEFLON in a wide variety of shapes and sizes. When you need finished TEFLON parts contact Garlock.

Write for TEFLON Catalog today!

THE GARLOCK PACKING COMPANY
PALMYRA, NEW YORK

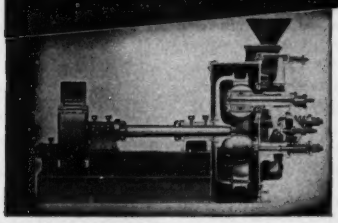
In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

*THE DU PONT COMPANY'S TRADEMARK

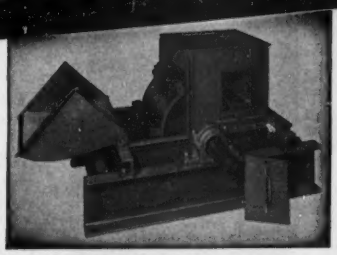
GARLOCK

**PACKINGS, GASKETS, OIL SEALS,
MECHANICAL SEALS,
RUBBER EXPANSION JOINTS**

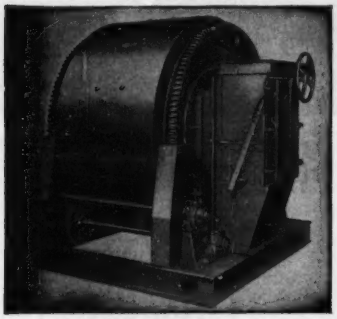
Step-up Production Lower Preparation Costs with STURTEVANT EQUIPMENT



RING ROLL MILL — for medium and fine reduction of hard or soft materials (10 to 200 mesh). Open-door accessibility for easy cleaning. Available in many sizes and capacities.

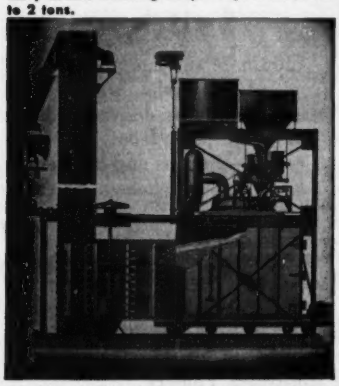


TAILINGS ROTARY PULVERIZER — increases output of fertilizer tailings . . . will not clog . . . leaves no daily accumulation of unground pellets. Capacities up to 25 tons per hour.

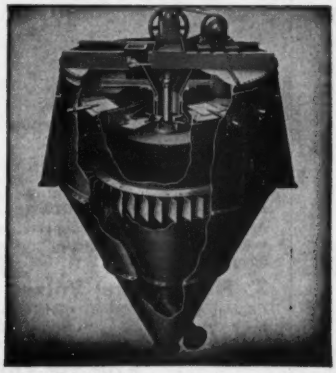


DRY BATCH MIXERS — 4-way mixing action mixes two or more ingredients into an inseparable, homogeneous mass. Open door accessibility makes cleaning easy. Capacities ¼ ton to 2 tons.

MOTO-VIBRO SCREENS — screen everything screenable. Open and closed models with or without feeders. Many types and sizes . . . screens from ½" to 60 mesh.



DEN AND EXCAVATOR — speeds processing of superphosphates. Easily operated by two men . . . produces 16 to 40 tons per batch and up to 480 tons per day of superior fertilizer free from lumps.



AIR SEPARATOR — for finest separation of materials. Capacities from ½ ton to 50 tons per hour in finenses of 40 to 325 mesh and finer. Increases production of fines, cuts power consumption costs.

Sturtevant Processing Equipment . . . Grinders, mixers, separators, screens, etc. . . . can help you *reduce* today's high manufacturing costs by increasing both machine and operator output, lowering production costs, assuring high quality products.

Records in all types of industries — chemical, plastics, ceramics, cement, food, construction — prove that this equipment works dependably day in, day out with little, if any, maintenance.

Used individually or linked together in proper sequence, they do the job faster and easier than other types . . . handle a larger variety of work.

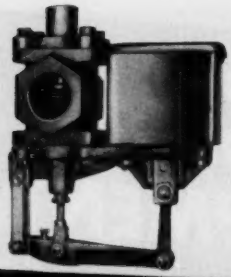
It will pay you to investigate Sturtevant Processing Equipment for your plant. There is a size and type of machine that will meet your requirements. Write for information.

STURTEVANT MILL COMPANY

100 CLAYTON STREET
BOSTON 22, MASSACHUSETTS

Designers and Manufacturers of:

CRUSHERS • GRINDERS • SEPARATORS
CONVEYORS • MECHANICAL DENS
and EXCAVATORS • ELEVATORS
MIXERS



JOHNSON
Direct Acting
SOLENOID VALVE

HERE'S a heavy duty, wide-range valve for all automatic, or remote, flow control. Has no pilot valves or auxiliary pistons; handles differential pressures to 150 lbs. in some sizes, temperatures to 400° F; provides immediate response. Available with stainless steel valve and seat or Jenkins disc; for normally open or normally closed service; sizes from ½" to 3".

Where can you use it?
Write for Bulletin. V.

The Johnson Corporation
848 Wood St., Three Rivers, Mich.

TALC
. . . IN EVERY GRADE
MOST COMPLETE RANGE OF SELECTION

Call on Whittaker
"The Talc House"

TRUE TALCS—Best for cosmetics, pharmaceutics, food processing.
SOFT PARTICLE TALCS — For textile industry, ceramic manufacturers, dusting powders.
FIBROUS TALCS — For paints and ceramic whiteware.
HIGH IRON CONTENT TALCS — Widely used in the paint, rubber, foundry and similar industries.

WHITTAKER HAS A TALC FOR EVERY MANUFACTURING NEED

WHITTAKER CLARK & DANIELS, INC.
Processing Dept. A
260 West Broadway New York 13, N. Y.
Canadian Representative
Richardson Agencies, Ltd. 454 King Street, W. Toronto

SAVE MONEY!
STOP COSTLY WORK CLOTHES REPLACEMENTS

Worklon Industrial Apparel
RESIST ACIDS AND CHEMICALS
Outwear cotton and wool 13 to 1
they're DuPont Orlon
new acrylic fiber; fabric by Travis

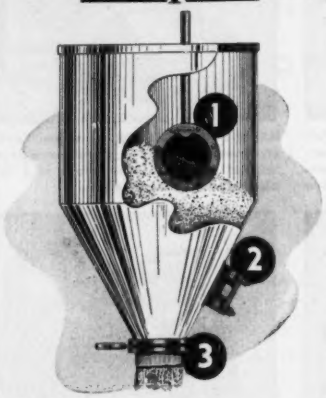
Lab tests prove Worklon clothes will:
- Resist acid and chemical deterioration
- Resist mildew, sunlight, grease, abrasion, Ultra-Violet rays
- Launder and dry quickly, retain crease with little or no ironing

WORKLON®

WORKLON, INC.
Dept. C-3
253 West 28th St., New York 1, N.Y.
Gentlemen:
Please send FREE CATALOG of Industrial Apparel of Orlon . . . & DuPont acrylic fabric.
Firm Name_____
Address_____
City_____ State_____
Dept_____

for Complete Hopper Efficiency

SYNTRON



1. Hopper Level Switches

Eliminate spillage and shortage of materials. Automatically maintains desired levels of materials—from fine to coarse—in bins and hoppers. Control feeding.

2. Electric Vibrators

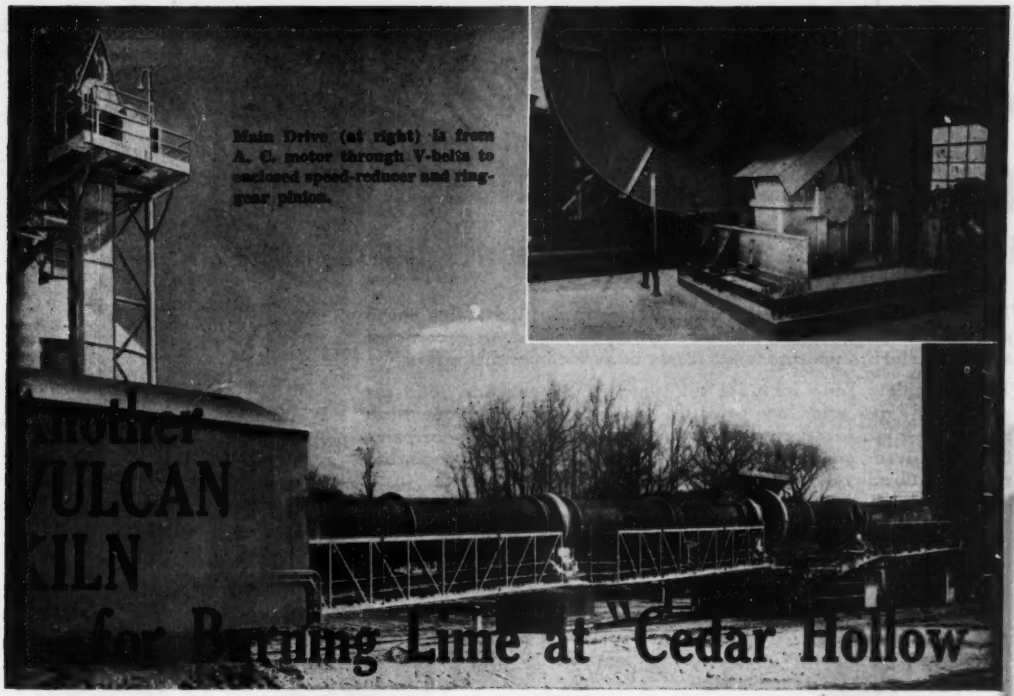
Assure free-flowing bins, hoppers and chutes. Eliminate arching and plugging of materials without hammering and rodding that damages equipment and wastes manpower.

3. Flow Control Valves

Control flow of bulk materials from bins, hoppers and chutes. Rotating control lever increases or decreases opening of flexible iris type diaphragm and flow of material without jamming or clogging.

Write For FREE Illustrated Folders

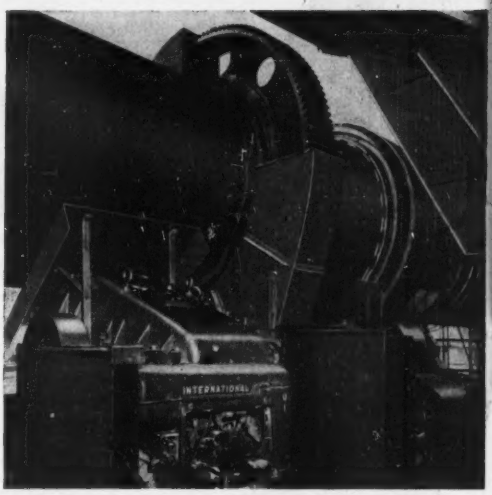
SYNTRON COMPANY
610 Lexington Avenue Homer City, Penna.


Main Drive (at right) is from A. C. motor through V-belts to enclosed speed-reducer and ring-gear pinion.
Another
VULCAN
KILN
for Burning Lime at Cedar Hollow

When the Warner Company's Cedar Hollow, Pa. plant first went into operation, in 1916, it was equipped with an 8′ x 150′ Vulcan Rotary Kiln which is still in operation and still giving good service. To meet the need for greater capacity, however, another Vulcan Rotary Kiln has recently been installed as shown in the illustrations.

The new kiln is not only much larger (9′ x 300′) but also embodies every modern feature to assure efficient, economical operation. The very heavy all-welded steel shell is mounted on our latest-type supporting roller and thrust bearings; all of which are automatically lubricated and easily adjusted to compensate for wear or moderate misalignment. Main drive and auxiliary drive both have an ample margin of power over any probable requirement and are as fully enclosed as possible, to promote cleanliness and safety. Other features, specified by the Warner Company's experienced engineers and production executives, assure maximum capacity and minimum fuel consumption under their particular operating conditions.

Detailed information regarding Vulcan Rotary Kilns for lime plants, cement plants, and other modern applications is given in our 28-page, fully illustrated, bulletin No. A-442. Write for it if you can use it to advantage.



Auxiliary Drive (above) is from gasoline engine through Morse clutch-coupling and V-belts to same enclosed speed reducer as for main drive.

VULCAN IRON WORKS

Established 1849

Main Office and Works **WILKES-BARRE, PA.,** New York Office 50 Church

Rotary Kilns, Coolers and Dryers	Double-Roll Briquetting Machines	Heavy-Duty Electric Hoists	Steam Locomotives
Rotary Retorts, Calciners, Etc.	Open-Hearth Steel Castings	Self-Contained Electric Hoists	Diesel and Gasoline Locomotives
Improved Vertical Lime Kilns	Steel-Plate Fabrication	Scraper-Loading Hoists	Diesel-Electric Locomotives
Automatic Quick-Lime Hydrators	Shaking-Chute and Chain Conveyors	Cast-Steel Sheaves and Gears	Electric Locomotives and Larrys

Powell Performance

proved by actual service records

in Chemicals and Process plants throughout the country

The marked preference for Powell Valves in both chemicals and process plants throughout this country is based on records of actual performance under all kinds of service conditions.

The Complete Line includes all types in Bronze and Iron for water, oil, gas and low pressure steam; Cast Steel for high pressure—high temperature services and, for handling corrosive fluids, valves in the greatest variety of corrosion-resisting metals and alloys ever made available to these industries.

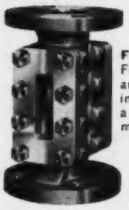


Fig. 2096 — Square Glass Sight Feed. Flanged ends. Designed and built for long service. Made in Bronze, Cast Iron, Steel and a variety of corrosion-resisting metals and alloys.

The Wm. Powell Co., Cincinnati 22, Ohio

Fig. 1793—Large 125-pound Iron Body Bronze Mounted Gate Valve. Sizes 2" to 30", incl. Has flanged ends, bolted flanged yoke, outside screw rising stem and tapered solid wedge.

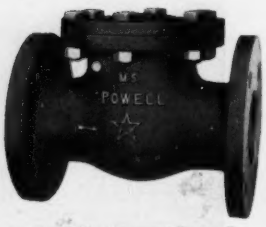


Fig. 2433—150-pound Bronze Regrinding Swing Check Valve with flanged ends, bolted flanged cap.

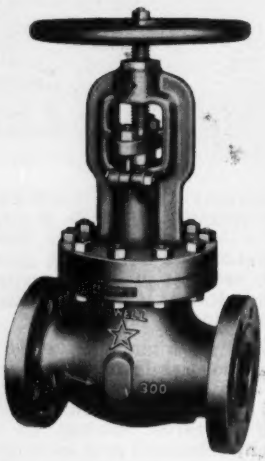


Fig. 3031 S. S. — 300-pound Stainless Steel O. S. & Y. Globe Valve. Conforms to all latest standards. Available in various other corrosion-resisting metals and alloys.

Fig. 1832 —200 pound Stainless Steel Gate Valve. Inside screw rising stem, screwed ends and screwed-in bonnet. Available in many corrosion-resisting metals and alloys.

Powell Corrosion-Resisting Valves are made in these Metals and Alloys

Stainless Alloys	Cast Irons	Nickel and Nickel Alloys	Bronzes—Acid, Aluminum, Silicon	Alloy Steels
18-8S	Cast Iron	Nickel	Carbon Steel	
18-8S Mo.	3% Nickel Iron	Monel Metal*	Everdur	4-6% Cr. 5% Mo.
18-8S Cb.	Ni-resist*	Inconel*	Herculoy	3.5% Nickel Steel
Misco "C"		Hastelloy Alloys (A, B, C and D)	Ampco††	6-8% Cr. .5-.75% Mo.
Durimet 20	**Aluminum**		Ampcoloy††	8-10% Cr. 1.1-1.5% Mo.
11.5-13.5% Cr. Iron	Alcoa No. 43		76	
18% Cr. Iron	Alcoa No. B-214	Illium	90-10	**Silver Hard Lead**
28% Cr. Iron	Alcoa No. 61 S-T	D-10	88-10-2	
25% Cr. 12% Ni.				**Molybdenum**

*Registered trade-names of the International Nickel Co., Inc.

†Registered trade-name of the Haynes-Stellite Co. ††Registered trade names of Ampco Metal, Inc.

POWELL VALVES

In Bronze, Iron, Steel and Corrosion-Resisting Metals and Alloys.

Cut out
OVERLOADING
UNDERLOADING

with
SYNTRON
"Vibra-Flow"

VIBRATORY FEEDERS

Syntron Vibratory Feeders provide an efficient, economical method of conveying bulk chemicals and the simplest and easiest means of controlling the rate of flow.

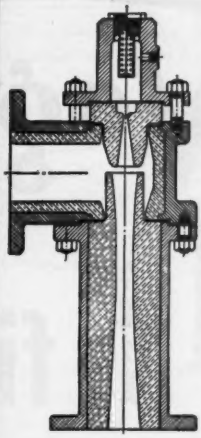
All along your chemical production line materials can be made to flow as desired—your processing plant need never be starved or overfed—with Syntron Vibratory Feeders your feed rate can be varied to provide a flow of materials to suit your needs.

Overloading or underfeeding is thus avoided without constant supervision—no more overflows that waste costly chemicals—no more tie-ups or material shortages that slow production—your processing can be continuous with maximum output and efficiency, plus—mimimum maintenance costs. Due to the absence of mechanical wearing parts, Syntron Feeders operate with an exceptionally low maintenance cost.

Write For Your FREE Copy Of Our 25 Page Booklet

SYNTRON CO.
810 Lexington Ave. Homer City, Pa.

C-R EVACTORS
MEET CORROSION PROBLEMS



The chemical industries are employing more and more Croll-Reynolds Evactors in vacuum processes where corrosion-resistance is a major consideration. These steam jet vacuum units provide pressures ranging from a few inches to a few microns. Croll-Reynolds is a pioneer in the use of new construction materials and our engineers are investigating corrosion problems continually.

Stainless steels, Monel metal, Beryllium copper, Ni-Resist, PMG metal, hard lead, special bronzes, Hastalloy, and Illium are but a few of the special metals which find their way into our equipment. Carbon is used extensively as a lining material, and many plastics, including Teflon, and synthetic materials are used for making complete Evactors.

Consult our Engineers for high vacuum equipment carefully designed for your specific conditions, and constructed of materials selected for your particular conditions.

CROLL C-R REYNOLDS

CROLL-REYNOLDS., INC.
Main Office: 751 Central Avenue, Westfield, New Jersey
17 John Street, New York 38, N. Y.
CHILL VACTORS STEAM JET EVACTORS CONDENSING EQUIPMENT

(His business paper
. . . of course)

This business paper in your hand has a plus for you, because it's a member of the Associated Business Publications. It's a *paid* circulation paper that must *earn* its readership by its quality. And it's one of a leadership group of business papers that work together to add new values, new usefulness, to make the time you give to your business paper *profitable* time.

With the pushing pace of business today, your business problems won't wait. That's why the **Best Informed Men in your Field** so often take their business papers home to read. Competition won't stand still, or costs stay put; and new products come so fast you've *got* to read every issue. You need the news of what's new, what's happening . . . .the what-to-do-and-how . . . and the what-to-do-it-with that you find in the editorial and advertising pages. It pays to read both . . . thoroughly . . . at home or on the job. That's what keeps *you* one of the **Best Informed Men in your Field.**

CHEMICAL ENGINEERING

ABP

One of a series of advertisements prepared by THE ASSOCIATED BUSINESS PUBLICATIONS
F 75

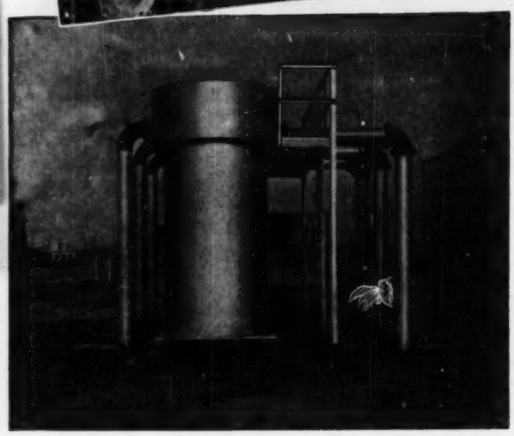
Dirty Water can't "Shut-down"...

Vogt

film type exchangers

(Condensers—Coolers—Evaporators)

Patent Nos. 1,935,270 - 2,057,597 - 2,424,441



River water, well water or brackish water are all alike to this exchanger *because it can be cleaned* while in operation! The water distributing ferrules need only be removed successively for the cleaning brush or tool whereby the tubes receive additional water which sluices away the dislodged dirt.

Vogt Film Type Exchangers are operating with real economy of first cost, operation and maintenance in power, petroleum, and chemical industries. They serve as Jacket Water Coolers, Feed Water Heaters, Hydrocarbon Evaporators, Sulphuric Acid Coolers, and Sulphur Dioxide Condensers, and can be designed to cool or heat any liquid and to condense or evaporate any fluid.

TOP: *Four units at Newton Falls, Ohio Municipal plant cool water for diesel engines and a lubricating oil cooler.*

BOTTOM: *Jacket Water Coolers serving engines of 7,300 HP in the compression plant of a Western Oil Refinery.*

[Bulletin HE-7 describes typical installations of Vogt Film Type exchangers and is available upon request.]

HENRY VOGT MACHINE CO., LOUISVILLE, KY.

Branch Offices: NEW YORK, CHICAGO, CLEVELAND, DALLAS, PHILADELPHIA, ST. LOUIS, CHARLESTON, W. VA.

FROM ROADSTANDS...

TO LAUNDRIES

CHECK CORROSION FROM ACIDS AND ALKALIES LONGER WITH

Protecting surfaces from deterioration is a "natural" for rubber-base paint. Parlon (Hercules chlorinated rubber) in protective coatings adds specific resistance to the action of chemicals, gases, moisture, mold growths, and other destructive agents.

Parlon rubber-base paint dries fast . . . seals and protects surfaces . . . resists acids, alkalies, fumes, and salts three to four times longer than ordinary coatings. Rubber-base paint is especially helpful in solving maintenance problems for laundries where moisture, humidity, and alkaline solutions are present, and for roadstands where kitchen heat and fumes are part of the working environment.

Parlon rubber-base paint is particularly durable on concrete because of its resistance to free alkali in cement. Ask your paint supplier about easy-to-apply and economical-to-use rubber-base paint—or write direct for details.

HERCULES POWDER COMPANY
INCORPORATED
Cellulose Products Department
952 Market St., Wilmington 99, Delaware

RUBBER-BASE (PARLON)® PAINTS

CR52-3

COVER THE EARTH

Lilly

SHERWIN-WILLIAMS

Celanese
CORPORATION OF AMERICA

SINCLAIR

GOLD SEAL

ALL THESE FIRMS CHOSE The Cowles DISSOLVER

. . . because it dissolves and disperses 2 to 20 times faster — and in the same space ordinary mixers require! The secret: the Cowles impeller which operates at velocities up to 7,500 f.p.m.

The Cowles Dissolver saves not only time and labor, it improves your product and yield per batch as well. It's rugged, fast-loading, easy to maintain, performs tasks other mixers cannot.

GET THE FACTS . . . on the Cowles Dissolver — send for a catalog today! And ask to have a detailed test run on your materials.

The Cowles Company
INCORPORATED

THE COWLES COMPANY, INC.
112 Trackside, Cayuga, N.Y.

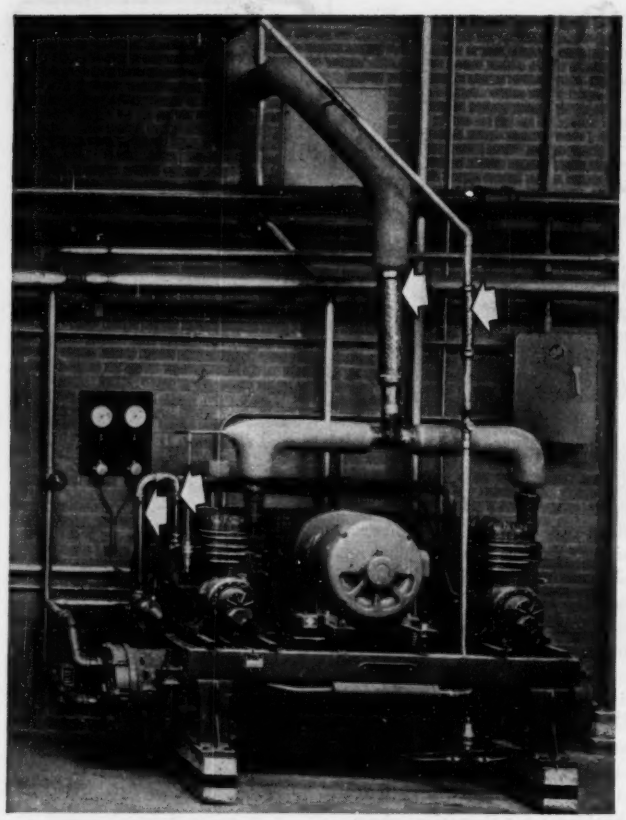
Gentlemen: Please send me your latest Cowles Dissolver catalog.

NAME

COMPANY

ADDRESS

CITY AND STATE



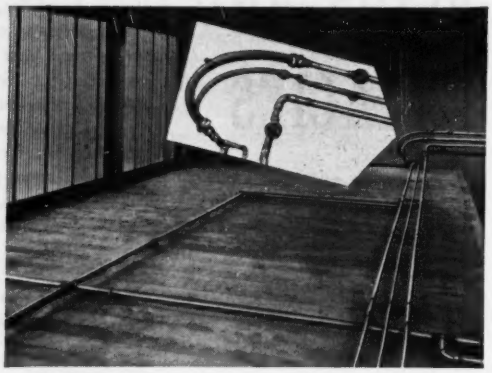
News about flexible metal connectors

Here they absorb VIBRATION, permit EXPANSION, withstand PRESSURE and HEAT

VIBRATION These twin compressors are part of an office air conditioning system. To prevent transmission of noise and vibration to refrigerant lines, American Vibration Eliminators have been used. They have proven their usefulness many times where vibration might crack rigid piping or make maintenance difficult. Leakproof and permanent as piping, they safely convey such liquids and gases as freon, brine, chlorides, etc., under high and low pressure.

PRESSURE and HEAT In this Littleford Pressure Distributor, American Flexible Steel Tar and Asphalt Hose, in constant motion, sprays hot tar under pressure. It handles easily, withstands outdoor exposure. If you want hose that can endure such rugged service, yet installs quickly, is convenient to use, and needs little attention, plan on American Flexible Metal Hose and Tubing.

Write for Booklet SS-50 – gives complete information on American Flexible Metal Connectors and their uses. The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn. In Canada: The Canadian Fairbanks-Morse Co., Ltd.

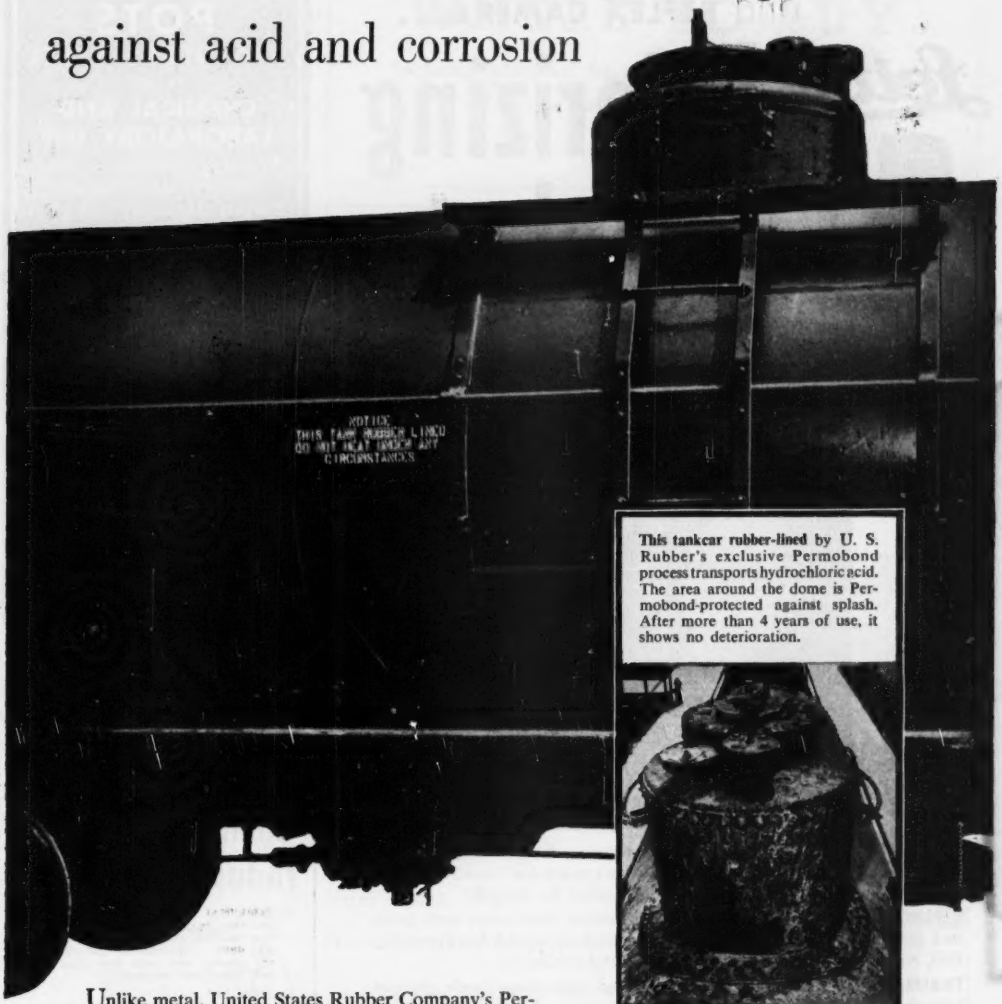


EXPANSION Hot water for this shower system flows 200 feet. To make proper expansion loops with rigid piping would be a plumber's nightmare of joints! The simple solution: easily installed American Flexible Metal Connectors. They allow for ample expansion and readily handle required pressure. They may be also used to carry steam, oil, syrups, solvents and even certain semisolids.

ANACONDA

wherever connectors must move *American* flexible metal hose and tubing

How U. S. Rubber's Permobond protects against acid and corrosion



This tankcar rubber-lined by U. S. Rubber's exclusive Permobond process transports hydrochloric acid. The area around the dome is Permobond-protected against splash. After more than 4 years of use, it shows no deterioration.

This dome, not protected with Permobond, has been in service only two years and already needs replacement. Original Permobond protection would have cost only a fraction of the total charge for this expensive replacement.

Unlike metal, United States Rubber Company's Permobond linings are not affected by acids and gases. Permobond linings are impermeable, and can be bonded or applied to almost any fabricated metal section, big or small, simple or complex. They save untold millions in replacement costs every year. United States Rubber Company engineers will gladly discuss your corrosion problems with you. Very often they can install and thoroughly vulcanize Permobond to existing equipment. Write to address below.

PRODUCT OF U.S.RUBBER SERVING THROUGH SCIENCE

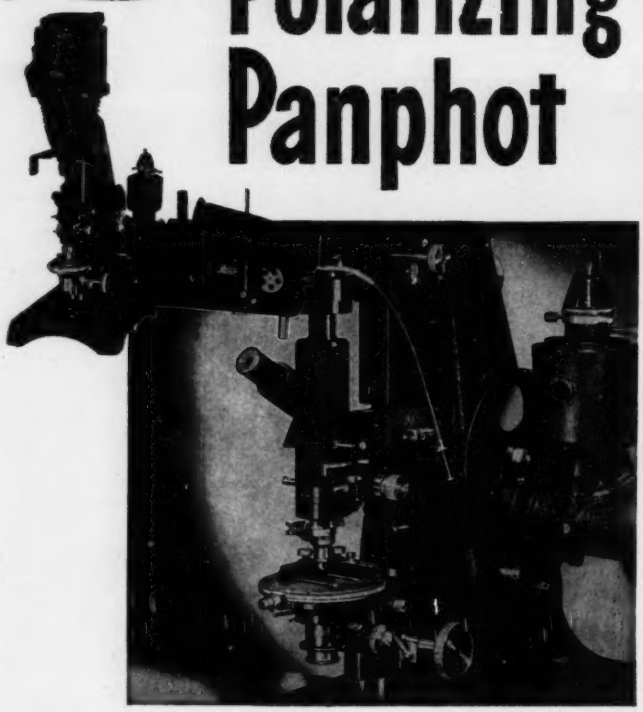
UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Perfect combination of
POLARIZING MICROSCOPE
and **REFLEX CAMERA...**

Leitz®

Polarizing Panphot



Compared with ordinary polarizing microscopes, the Leitz Panphot is a distinct innovation, for microscope and reflex camera are *combined* in one complete, easy-to-use unit. It is particularly suited for use with:

REFLECTED LIGHT — Large polarizing vertical illuminator, with prism and glass plate, makes the Panphot standard equipment for examining ores, metal, coal and all other opaque mineral specimens.

TRANSMITTED LIGHT — Polarizing substage and object clutch changer convert Panphot to research petrographic microscope with built-in photomicrographic camera.

PHOTOMICROGRAPHY — Simple withdrawal or insertion of lateral observation tube enables user to examine microscope image visually and then photograph it immediately afterwards.

GROUP WORK — The Panphot can also be used for demonstrating to a small group of observers or for micro-drawing.

Accessories such as heating stages, integrating stages, universal stages, phase accessories and Ultropak equipment can be used with the Panphot, making it an ideal instrument for research and industrial laboratories. The Panphot is now available for 3¼ x 4¼ inch plates and cut film and a 4 x 5 inch Graflok back.

For details, write Dept. CE

E. LEITZ, Inc., 304 Hudson Street, New York 13, N. Y.

LEITZ MICROSCOPES • SCIENTIFIC INSTRUMENTS • BINOCULARS
LEICA CAMERAS AND ACCESSORIES

BEAKERS
POTS
STAINLESS STEEL
for all
CHEMICAL AND
LABORATORY USE

We also manufacture other Stainless Steel Products
Buckets, Measures and other Special Products

LEADING COMPANIES ARE OUR SATISFIED CUSTOMERS

AMERICAN METAL SPINNING AND STAMPING COMPANY
130 E. 13 St. N. Y. 3, N. Y.

NEED HELP?

. . . in planning sales to the

Chemical Process Industries

CHEMICAL ENGINEERING, the production-engineering workbook of the market, can provide the data you need . . . to establish potentials, set quotas and help you plan to sell tomorrow's markets.

Write for:

- ***Business Plans For New Plants and Equipment: 1952-55***
- ***The Battle For Production***
- ***Marketing Audit for the Chemical Process Industries***
- ***Geographical Distribution of the Chemical Process Industries***

Chemical Engineering

The Production Workbook of the Chemical Process Industries

A McGRAW-HILL PUBLICATION • 330 W. 42ND ST., NEW YORK 36, N. Y.

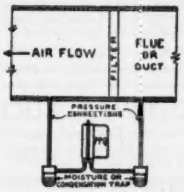
CONTROL

FROM MINUTE CHANGES IN THE RELATIONSHIP OF TWO PRESSURES

MERCOID DIAPHRAGM DIFFERENTIAL PRESSURE CONTROLS OPERATE FROM MINUTE CHANGES (.03"WATER) IN THE DIFFERENCE BETWEEN TWO PRESSURES.

RANGES TO COVER MOST APPLICATIONS (INCHES OF WATER) 6"VAC. TO 6" PRESS., AND 30"VAC. TO 30" PRESS. AVAILABLE FOR VARIOUS CIRCUIT ARRANGEMENTS.

CAN BE FURNISHED IN EXPLOSION PROOF OR WEATHER PROOF CASES.



Illustrated above is a standard application whereby the Type PPQ functions to open (or close) an electrical circuit from a variation in pressure differential due to a clogging filter.

WRITE FOR BULLETIN PPQ

THE MERCOID CORPORATION
4205 BELMONT AVE. CHICAGO, ILL. U.S.A.

TANK-O-METER

FOR MEASURING TANK CONTENTS ANY DISTANCE AWAY

TANK MAY BE BURIED, ELEVATED, OPEN, CLOSED, VENTED OR UNDER PRESSURE OR VACUUM

ALSO...

HYDROSTATIC GAUGES

FOR ALL PURPOSES

PRESSURE • VACUUM • DRAFT
DEPTH & ABSOLUTE PRESSURE
DIFFERENTIAL PRESSURE
MERCURIAL BAROMETERS

SEND FOR BULLETINS

UEHLING INSTRUMENT CO.
491 GETTY AVE., PATERSON, N.J.

WHERE TO BUY

Featuring additional Equipment Materials, Supplies and Service for the Process Industries

DRYERS and KILNS...

For all purposes

W. P. HEINEKEN, Inc.
Engineers & Manufacturers

50 BROAD ST.
New York, N. Y.

FEED MATERIAL BY WEIGHT

THE MERRICK FEEDOWEIGHT

MERRICK SCALE MFG. CO.
171 SUMMER ST., PASSAIC, N. J.

Your Inquiries to Advertisers Will Have Special Value . . .

—for you—the advertiser—and the publisher, if you mention this publication. Advertisers value highly this evidence of the publication you read. Satisfied advertisers enable the publisher to secure more advertisers and—more advertisers mean more information on more products or better service—more value—to YOU.

Manufacturers of

METALLIC POWDERS

FLAKE
CHIP
or
GRAIN FORM

MAGNA MANUFACTURING CO., INC.
Plant: HASKELL, NEW JERSEY

YATES COMPANY
EXTRUDED PLASTIC PRODUCTS
Precision Extruders of Rods, Tubes, Strips, Special Shapes for builders hardware, chemical industries, electronics, furniture, toys.
Send inquiries for engineering recommendations.
YATES COMPANY
2211 Cemetery Road Erie, Pa.

CHEMSTEEL CONSTRUCTION COMPANY, INC
101 Chemsteel Bldg., Walnut St., Pittsburgh 22, Pa.
Send data on Engineering & Construction facilities for
ACID-ALKALI-PROOF CONSTRUCTION
of processing & storage tanks & flooring.

NAME.....
COMPANY.....
ADDRESS.....
CITY.....ZONE.....STATE....

PROFESSIONAL SERVICES

PATENTS · PLANT DESIGNS · RESEARCH
REPORTS · INVESTIGATIONS · MANAGEMENT
TESTING · GENERAL CONSULTING · TRANSLATIONS
CHEMICAL AND BACTERIOLOGICAL ANALYSIS

R. S. ARIES & ASSOCIATES
Chemical Engineers & Economists
COMMERCIAL CHEMICAL DEVELOPMENT
Process Analysis • Market Research
Surveys—Technical and Economic
Design & Initial Operation of Complete Plants
Licensing of New Processes & Products
New Product Development
400 Madison Ave. EL-5-1420 New York 17, N. Y.

When you need a SPECIALIST in a hurry . . .
Chemical Engineering's Professional Service Section offers the quickest, most direct method of contacting consultants who may be available NOW.

PROCESSES RESEARCH, INC.
Chemical & Mechanical
Process Design, Development, Economics, Special Process Equipment and Machine Design, Site Searches, Plant Layouts, Investigations.
2905 Vernon Place Cincinnati 19, Ohio

W. L. BADGER
CONSULTING CHEMICAL ENGINEER
Evaporation, crystallization, and Heat Transfer; Complete plants for salt and caustic soda; Complete Dowtherm installations.
309 South State Street Ann Arbor, Mich.

KNOWLES ASSOCIATES
Chemical—Metallurgical—Mechanical Engineers
Consultation — Design
Complete Plants — Equipment
Heavy Chemicals — Ore Dressing
19 Rector Street New York 6, New York
Bowling Green 9-3456

GUSTAVE T. REICH
Consulting Chemical Engineer
DEVELOPMENTS — OPERATION
CARBOHYDRATES INDUSTRY
BY-PRODUCTS
CARBON-DIOXIDE — WASTE DISPOSAL
Packard Building Philadelphia, Pa.

J. PAUL BISHOP AND ASSOCIATES
Food and Chemical Engineers Consulting
Specializing in:
Designing, Estimating and Engineering of New and Modernizing of Old Food and Chemical Plants and Processes.
Internationally Known
Write P.O. Box 348
Champaign Illinois

KOHN & PECHENICK
Consulting Chemical Engineers
Plants — Process — Equipment
DESIGN
Reports Trouble-Shooting Appraisals
262 Huron St. Brooklyn 22, N. Y.

SANDERSON & PORTER
Engineers and Constructors
New York • Chicago • San Francisco

CARL DEMRICK
Technical Translations
Send for Circular
58 So. Broadway Yonkers, N. Y.

THE KULJIAN CORPORATION
Consultants • Engineers • Constructors
Chemical • Industrial • Process
1200 N. Broad St. Phila. 21, Pa.
Offices Throughout the World

J. E. SIRRINE COMPANY
Engineers
Plant Design & Surveys covering Chemical, Electrochemical and Metallurgical Production; Trade Waste Disposal; Water Supply & Treatment; Analyses & Reports.
Greenville - - - - - - - - - - South Carolina

RICHARD F. ENNIS, JR.
Consulting Chemical Engineer
Engineering and Economic Studies
Design—Development—Research
Lincoln-Liberty Bldg. Philadelphia 7, Pa.

JACKSON D. LEONARD
Consulting Chemical Engineer
Cost Reduction Programs for the Process Industries
Maintenance Programs — Utility Conservation
Suggestion Systems — Cost & Economic Analysis
Process Design — Process Improvement
90 Spring Street Metuchen, N. J.

MARCUS SITTENFIELD
Consulting Chemical Engineer
Plants - DESIGN - Equipment
Economic - SURVEYS - Technical
Process - DEVELOPMENT - Product
Registered Professional Engineer
1411 Walnut St. Philadelphia 2, Pa.

EVANS RESEARCH AND DEVELOPMENT CORPORATION
Organic and Inorganic Chemistry Processes—Products
250 East 43rd St. New York 17, N. Y.

C. L. MANTELL
Consulting Chemical Engineer
Process Research and Engineering
Development
457 Washington Street New York 13, N. Y.

FOSTER D. SNELL, INC.
Research Chemists and Engineers
A staff of 75 including chemists, engineers, bacteriologists and medical personnel with 10 stories of laboratories and a pilot plant are available for the solution of your chemical and engineering problems.
Write today for Booklet No. 3
"The Chemical Consultant and Your Business"
29 West 15th St. New York 11, N. Y.

FRASER-BRACE ENGINEERING CO., INC.
Designs Engineers & Constructors of
Hydro-electric Developments
Metallurgical, Explosives, & Industrial Plants
Chemical & Process Industries
Railroads — Tunnels — Port Facilities
10 East 40th St., New York 16, N. Y. Lex 2-5570

MELVIN NORD, DR. ENG. SCI., LL.B.
Consultant in Legal and Technical Problems
REGISTERED PROFESSIONAL ENGINEER
CHEMICAL ENGINEER
PATENT ATTORNEY
664 Putnam Detroit 1, Mich.

NICOLAY TITLESTAD CORPORATION
Chemical Engineer
Design — Consultation — Complete Plants
sulphuric acid — phosphoric acid
nitric acid — oxidation of ammonia
nitrogen products — acid concentration
surplus dioxide — carbon bisulphide
11 W. 42nd Street, N. Y. 18 PE-6-0010

GEORGE H. KENDALL
Consulting Mechanical Engineer
Cost Reduction Studies; Process or Product. Redesign Existing Products for Greater Profit. Trouble Shooting Production, Design, Cost Problems. Specialists Automatic Machinery, Processes, Controls. New Developments, Patent Studies, Investigations. New Products & Process Engineering Studies
P. O. Box 2 (Est. 1922) Tel. Darien 5-1504
Norton Heights Darien, Connecticut

JAMES P. O'DONNELL
Engineers
CHEMICAL AND PETROLEUM PROCESS PLANTS
Design-Procurement-Construction Supervision Start-Up
39 Broadway, New York 6

THE J. G. WHITE ENGINEERING CORPORATION
Design - Construction - Reports - Appraisals
80 Broad Street, New York 4

The Re-Employment of REBUILT and USED EQUIPMENT

has made an important contribution to the "Builders of the Chemical Century."

The status of Used Machinery has taken on a real significance to the Chemical field and the facts concerning this importance are well worth reviewing.

Let us first explore the question, "What would appraised values of physical assets mean if there were no used equipment dealers?" The answer is, "Nothing." Buyers would have to come from individual plants and the ability of those plants to absorb the equipment offered would determine whether the price asked is realistic or whether the equipment should be sold as junk.

When surplus equipment is released, the dealers absorb the entire stock. By warehousing the equipment for future needs of the industry, they keep values in balance and do much to eliminate the peaks and valleys incidental to a shortage or over-supply.

The dealers are in business to make a profit and that fact in itself is assurance to those who buy from them. Equipment they buy must be suitable for resale at a profit. That means it must be in good operating condition. It cannot be obsolete or so abused that no one wants it—that it finds no buyers.

Reconditioning and Rebuilding

These dealers are much more than brokers bringing buyer and seller together for their own profit. They are strongly organized business firms with considerable capital. Many of them were established in the early part of this century. Their growth has paralleled the growth of the industry and their services and facilities have kept pace with the demands placed upon them.

Reconditioning and rebuilding of the equipment they buy is a common practice. Their shops are well equipped and are manned with skilled workers and engineers who are familiar with equipment of widely varied types and makes. From these shops they now ship equipment to all parts of the United States and to many foreign countries.

Their rebuilding standards are high and their guarantees adequate to satisfy the most cautious buyers. And satisfied customers are just as important to the dealers as to any other type of business. So every effort is made to satisfy the user-buyer and build a customer list for repeat sales.

Major Markets

Limited use of equipment or limited finances create two major markets. The buyer who *can afford* and *should have* new equipment is seldom influenced to buy used equipment through savings to be made. The infrequent exception can usually be traced to the dominant saving characteristics of the buyer rather than to strong competitive selling on the part of the dealer.

Limited finances create a considerable marketplace for used equipment. Plants with limited resources and antiquated equipment find it possible to accomplish urgent modernizing or improvement in production because of the equipment available from dealer stocks. Individuals and experimenters, small firms just starting or forced into rapid expansion of production facilities find the modern dealer an invaluable ally.

Infrequent operation creates another marketplace. Many large, nationally known and well financed companies occasionally buy used equipment. Certain conditions justify it and would label any other purchase an error in judgment. When these plants need equipment for occasional operation, experimental purposes or temporary expansion, sound judgment frequently calls for the purchase of used equipment.

War and Defense Conditions

During times of national emergency, the dealer in used equipment plays a most important role. Then, time is of the essence. To wait months for equipment needed today would be disastrous. Immediate delivery becomes a most important factor. Here the services of the responsible dealer and rebuilder play a most important part. In Washington their importance is fully recognized and requests go out to the dealers for inventories of available equipment and for complete data relative to age, type, make, condition, etc. The re-employment of used equipment during these times often means the difference between meeting schedules or handicapping the war or defense effort.

What of the Future?

A concensus among dealers points to a healthy future for them and for the industry they serve. They are fully aware of the remarkable growth of the Chemical Industry and of the outlook for an even more fabulous future.

Their own plans, to meet the challenge inherent in the future outlook, call for constant study and even more alertness at the management level.

A steady improvement of their engineering and advisory service is being built. Now firms just starting and young firms faced with problems of expansion can turn to the dealer for advice and help in plant layout and procurement.

A strong trend which has been developing for some time is in the field of refinancing. No longer is a liquidation carried through without first studying the possibility of keeping the plant operating. When a liquidation is involved, the dealer frequently seeks a buyer who will operate the plant at the same location. At times he finances or secures financial help for local groups who are desirous of continuing the operation as an economic civic necessity.

As the Used Equipment Dealer expands his efforts along all these lines in an effort to better serve his customers, he realizes that reluctance and doubt must be swept from the minds of his clients. So he strives to maintain a high code of ethics and constantly campaigns to educate buyers to the end that they can purchase used equipment with full confidence.

By such standards it is hard to check the imagination in looking ahead to the final growth of this important field.

PAGES from the GELB NOTE BOOK

BROTHER, THAT'S A STEAK!

If you've ever been in Chicago and haven't gone to the small but famous Erie Cafe at Erie and Wells Street—you've never tasted STEAK!

The spectacular 7-inch thick steak has been featured at "the Erie" for years. The Erie is run by Richard and his son Larry Giometti, and Ernie Fontana, a partner, who spent so much time there he finally "bought in." Yolanda Lief is the waitress who, when she isn't doing deep reading, sets a sprightly table.

Everyone gets treated royally at the Erie, even Prince Olav of Norway when he stopped in a few years back.

Nello, the King of the Kitchen, worked in Chicago's best restaurants for over 20 years—came to the Erie to give free rein to his specialty—STEAK!

To see Nello prepare a steak is an education in itself. Salt, pepper and olive oil, melted butter . . . soon, the steak you have selected personally, is giving out heart-warming, mouth watering odors. Sometimes the Erie is so crowded you can't get a table—so you stand up and eat at Nello's serving counter. At the Erie you'll meet television stars, singers, composers, editors, lecturers, executives, coaches—everybody who loves friendly informal atmosphere and steaks that are properly selected and cooked to perfection.

So—next time you're in Chicago and you want real STEAK—go visit Larry, Rich, Ernie and Nello at the Erie.

Oh yes—be sure to tell them that LARRY GELB sent you!

Edw. Gelb

When my gentleman friend takes me to dinner he's always thinking of something to eat—but it's the check that really gives him indigestion.

The Gelb Girl

R. GELB & SONS, Inc.

STATE HIGHWAY No. 29 UNION, N. J.

UNionville 2-8900

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT: BUSINESS: "OPPORTUNITIES" EQUIPMENT USED OR RESALE

UNDISPLAYED —RATES— DISPLAYED

$1.20 per line, minimum 3 lines. To figure payment count 5 average words as a line.
POSITIONS WANTED and Individual Selling Opportunity undisplayed rate is one-half of above rate, payable in advance.
Box Numbers—count as one line.
Discount of 10% if full payment is made in advance for 4 consecutive insertions.
EQUIPMENT WANTED or FOR SALE Advertisements acceptable only in Displayed Style.

Individual Spaces with border rules for prominent display of advertisements.
The advertising rate is $11.80 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
An advertising inch is measured ⅞" vertically on one column, 3 columns—30 inches—to a page.
NEW ADVERTISEMENTS—Address New York office, 330 W. 42 St., N. Y. 36, for the August issue closing August 1st. C.E.

WANTED

Assistant to Sales Manager

Upper Michigan firm offers opportunity for man age 30-40 in capacity of Assistant to Sales Manager. Must be a chemical engineer with knowledge of industrial chemical business preferably copper chemicals. Must have selling experience. Will probably be located in large Ohio city to cover eastern and mid-west territory. Write giving qualifications and salary required to

P-4440 Chemical Engineering
520 N. Michigan Ave., Chicago 11, Ill.

PRODUCTION MANAGER

National AAA detergent manufacturer seeks fully qualified Production Manager. 40-50, good basic education in Chemical or Industrial Engineering or equivalent. Prefer ten or more years experience on all phases of production, including top management participation, in medium size company doing bulk and small unit high speed packaging of dry products. Excellence in human relations is a prime requisite. Salary open. If you are interested in a life-time career and excellent future with a multi-plant, growing concern, submit complete details in confidence first letter.

P-4544, Chemical Engineering
520 N. Michigan Ave., Chicago 11, Ill.

INDUSTRIAL SALES DEVELOPMENT ENGINEER

Experience necessary with proven record to develop sales in Sterilization and Fumigation Fields. Background of training and experience should be in one of the following: Engineering, Chemistry or Biology. Must be willing to locate in North Western Pennsylvania. Submit complete resume of qualifications. Please state salary range expected.

P-4494, Chemical Engineering
330 W. 42 St., New York 36, N. Y.

SUPERINTENDENT

for large Solvent Recovery Plant. Chemical Engineer with Petroleum Industry background preferred. Reply giving details re experience, education and salary desired.

P-4662, Chemical Engineering
330 W. 42 St., New York 36, N. Y.

ADMINISTRATIVE ENGINEER

Non ferrous indust'l exp. to assist. executive V.P. Assurance of excellent future for right man. Under 42.

Salary $15,000

"Many Junior Positions"
Call, write or wire:—Gladys Hunting (Consultant)
DRAKE PERSONNEL
7 W. Madison St. Chicago 2, Ill.

CHEMICAL ENGINEER

Large Western New York synthetic organic chemical plant has attractive permanent position for Chemical Engineer, preferably with 2 to 3 years' industrial experience, for plant engineering project work. Reply to

P-4484, Chemical Engineering
330 W. 42 St., New York 36, N. Y.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

CHEMICAL ENGINEER: Large new Chemical and Manufacturing company near New Orleans desires services of top notch Chief Engineer. Must be experienced in anhydrous ammonia production and preferably also Urea and Evaporator design and application knowledge. Interested applicants submit and state salary desired. P-4669, Chemical Engineering.

CHEMICAL OR Mechanical Engineer. Well established manufacturing corporation located in very desirable section of southeast requires chemical or mechanical engineer approximately 30 to 40 years of age with 7 to 12 years experience in design and operation of organic chemical plant, and preferably with supervisory experience, to be in charge of designing new development unit in plastic field. Please send complete resume regarding education, experience and personal information to P-4748, Chemical Engineering.

TECHNICAL WRITER-Chemical Engineer, or equivalent, with writing ability for sales promotional work with a major instrument manufacturer in Eastern United States. Training or experience in food processing and technology and/or process instrumentation desirable, although not mandatory. Please reply stating complete qualifications to JP-50, P. O. Box 8178, Philadelphia 22, Pa.

SELLING OPPORTUNITY OFFERED

SALES REPRESENTATIVE Wanted—Phenolic Resins. Willing to make commission arrangement if so desired. Our men have been advised about this advertisement. RW-4172, Chemical Engineering.

EMPLOYMENT SERVICES

SALARIED POSITIONS $3,500 to $35,000. We offer the original personal employment service (established 42 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered, present position protected. Ask for particulars. R. W. Bixby, Inc., 262 Dun Bldg., Buffalo 2, N. Y.

SALARIED PERSONNEL $3,000-$25,000. This confidential service established 1927, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. B, 241 Orange St., New Haven, Conn.

SALES ENGINEER

CORROSION RESISTING VALVES

Manufacturer of Stainless Steel Valves has opening for representative to call on process industries. Age to early thirties. Engineering degree and/or experience selling industrial equipment essential. Several locations open each requiring some traveling. Salary and bonus; car furnished. Send complete resume including age and salary desired.

RW-4578, Chemical Engineering
330 W. 42 St., New York 36, N. Y.

POSITIONS WANTED

CHEMICAL ENGINEER—Age 34. Research and production experience with leadership to handle plant personnel. Have ability to make processes run smoothly and profitably. PW-4764, Chemical Engineering.

CHEMICAL ENGINEER: Desires employment in which he may utilize 11 years experience in explosives and associated industries. Experience in research, development, production, technical service, sales, etc. Minimum salary $10,000/ year. PW-4620, Chemical Engineering.

CHEMICAL ENGINEER: eleven years supervisory experience in design, research, and production; alkali also mechanical fields. PW-4733, Chemical Engineering.

CHEMICAL ENGINEER—B.S. 49—Practical design and operation experience in pneumatic conveying, exhaust systems, dust collection, vacuum induction melting. Know how to make equipment work to get results. PW-4795, Chemical Engineering.

ENGINEERS AND Chemists available. More than 40 ME, ChE, and chemist graduates available within next 3 months, after completing 2 years service in Army research and development. Average age 24; most had pre-draft experience. Desire inquiries from prospective employers in all chemistry and engineering fields; any location. Will arrange group and individual interviews. Write HJ, Box 82, Frederick, Maryland.

EXECUTIVE CHEMICAL Engineer — Registered PE, 50, with substantial experience in plant management and engineering in alkali and organic field. Excellent record of getting results. Seeks position of responsibility in plant management, multi-plant production supervision, engineering, or consulting organization. PW-3919, Chemical Engineering.

SELLING OPPORTUNITIES WANTED

MFR. REP. est. 15 years desires additional power plant equipment accounts. Presently covering No. Ill. & No. Ind. industrials, contractors, laundries, etc. RA-4278, Chemical

CHEMICAL ENGINEER, B. Ch. E. Univ. of Minn. 1 yr. developing new territory for line of Fatty Acids, etc. 3 yrs. as materials engineer for large Controls Manufacturer, background in materials, finishes and fabrication. Desire change to Production, Development or other field. RA-4746, Chemical Engineering.

WEST COAST—Prof. Engineer, 20 years sales experience now setting up West Coast Agency. Interested in complementing present lines. Handling industrial construction materials or equipment for chemical and Food Plants, Steel Mills, Refineries, etc. Presently located in East. Plan active campaign and organization setup by end of year. RA-4703, Chemical Engineering.

AVAILABLE

EXECUTIVE CHEMICAL ENGINEER

Twenty years experience in petroleum and chemical industries. Project management; process, plant, equipment design supervision; construction; consulting; development new business.

PW-4466, Chemical Engineering
330 W. 42 St., New York 36, N. Y.

MANUFACTURER'S REPRESENTATIVE

covering western New York State desires to add one line. Extensive contacts with chemical, aircraft and general industry.

RA-4602, Chemical Engineering
330 W. 42 St., New York 36, N. Y.

UNUSUAL OPPORTUNITY FOR ENGINEERING EDITOR

McGraw-Hill has an attractive opening on the staff of this magazine for a chemical engineering graduate with 3 to 5 years of industrial experience—preferably in process development or design. Ability to write is a prime requisite. If interested please submit in confidence your qualifications, salary requirements and if possible report or other samples of your writing.

Sidney D. Kirkpatrick
Editorial Director

Available { CUSTOM REFINING FACILITIES
• Distillation • Extractions
• Separations • Fractionation
Drum Lots—Tank Cars

Wanted {
• All Types of Crude Mixtures
• By-Products, Residues, Wastes
Contaminated Solvents

TRULAND CHEMICAL & ENGINEERING CO., INC.

Box 426, Union, N. J. UNionville 2-7360

Largest known deposit of

BARITE

Average 90 per cent BaSO4
Near Hailey (southern) Idaho
Complete report available

HARRY A. HERZOG
410 Henry Bldg. Portland 4, Oregon

CHEMICAL PLANT

WANTED

We are now manufacturing over $20,000,000 in various lines and wish to expand by acquisition of assets or stock of one or more industrial companies. In our negotiations the sellers' problems and wishes will receive full consideration. Present personnel will normally be retained.

Address all replies

"Confidential" C. J. GALE, Sec.
233 Broadway, N. Y. 7, N. Y. BA 7-1818

WANTED—CHEMICAL PLANT

Experienced chemical organization is interested in managing, operating, and/or financing a going chemical business. We are prepared to make an investment up to $500,000.

All Replies Strictly Confidential

W-4586, Chemical Engineering
330 W. 42 St., New York 36, N. Y.

CASH BUYERS

of
Metal Fabricating & Chemical Plants for Removal
Used Machine Tools Bought and Sold

HERMAN MACHINERY & SUPPLY CO.
2110 St. Clair Ave. Cleveland 14, Ohio

WANTED

BY-PRODUCT POTASH SALTS LIQUID OR SOLID.

W-4083, Chemical Engineering
330 W. 42nd St., New York 36, N. Y.

TEACHING POSITIONS IN ISRAEL

The Hebrew Institute of Technology, Haifa, Israel, proposes to appoint 2 professors of Chemical Engineering; 1 professor of Metallurgy.

Applicants should have first-rate professional and academic qualifications, be willing to integrate themselves into the life of the country and, in due course, to teach in Hebrew.

Applications with full details should be sent, for transmission to Haifa, to:

THE AMERICAN TECHNION SOCIETY

80 FIFTH AVENUE
NEW YORK 11, NEW YORK

CHEMICAL PLANT

FOR SALE

Located in Scranton, Penna. area

Two acres—One half with buildings totalling 55,000 sq. ft.

Railroad Siding—Main Highway.
Non-restricted.
Very Low Price.

PEREZ EPSTEIN
1421 N. 6th St. Phila. 22, Pa.

WANTED

WILL BUY

Cancelled - Unshipped - Rejected or Over-Stocked

CHEMICALS—DRUGS
PLASTICIZERS - SOLVENTS
PHARMACEUTICALS
OILS—PIGMENTS, ETC.
BY-PRODUCTS—RESIDUES

Chemical Service Corporation

96-02 Beaver St. New York 5, N. Y.

AUTOCLAVE WANTED

1000-gallon capacity
300 psig. working pressure
Agitated
Jacketed

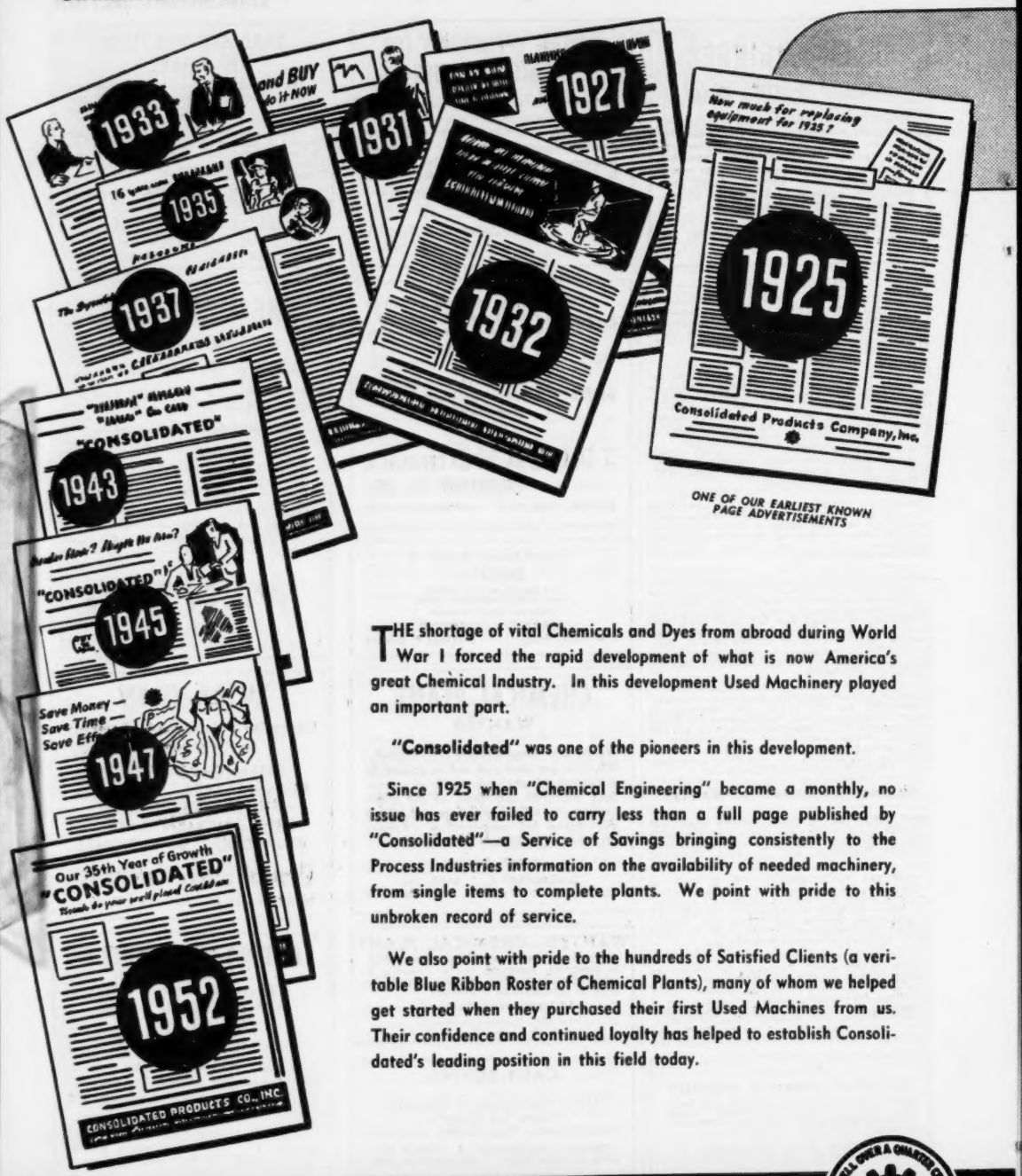
Write giving all information possible including price, manufacturer, condition location, working pressure of jacket, type of agitation, and if possible a drawing. WRITE:

SPENCER CHEMICAL COMPANY
Box 684 Pittsburg, Kansas
Attention: D. A. Young

WANTED

Vacuum Dryers, Heavy Duty Mixers, Reactors, Kettles, Columns, Rotary Filter, Pulverizers, Filter Presses, S/S and non-corrosive Tankage. Idle or Set Up Plant.

P. O. BOX 1351
Church St. Sta. New York 8, N. Y.



ONE OF OUR EARLIEST KNOWN PAGE ADVERTISEMENTS

THE shortage of vital Chemicals and Dyes from abroad during World War I forced the rapid development of what is now America's great Chemical Industry. In this development Used Machinery played an important part.

"Consolidated" was one of the pioneers in this development.

Since 1925 when "Chemical Engineering" became a monthly, no issue has ever failed to carry less than a full page published by "Consolidated"—a Service of Savings bringing consistently to the Process Industries information on the availability of needed machinery, from single items to complete plants. We point with pride to this unbroken record of service.

We also point with pride to the hundreds of Satisfied Clients (a veritable Blue Ribbon Roster of Chemical Plants), many of whom we helped get started when they purchased their first Used Machines from us. Their confidence and continued loyalty has helped to establish Consolidated's leading position in this field today.

OUR 35TH YEAR **"CONSOLIDATED"** *Buy with Confidence*

FOR WELL OVER A QUARTER CENTURY A SYMBOL OF CONFIDENCE

SINCE 1917—*Year after Year*—SERVING THE PROCESS INDUSTRIES

PRICE-SAVING OPPORTUNITIES

LIQUIDATION

Machinery & Equipment

of the former

DuPont Phosphate of Soda Plant
151st St. & Kennedy Ave.
East Chicago, Indiana
Phone 2040

Steel Storage Tanks, Mixing Tanks, S/S Agitated 13,500 gal. Tank, Tube Mill, Filters, Evaporators, Rotary Dryers, Screens, Crystallizers, Classifiers, Bird Centrifufal, Bucket Elevators, Redler Conveyors, Screw Conveyors, Labour S/S Pumps, Turbo Compressor, Hammer Mill, Scales, Duriron and Vacuum Pumps, Exhausters, Etc.

Send for detailed List.

WIRE—PHONE—WRITE

Arrange to inspect.
Representative on Premises

LIQUIDATING

THESE ITEMS STILL ON LOCATIONS WHERE USED. SUBSTANTIAL SAVINGS IF YOU BUY NOW, BEFORE REHANDLING AND REMOVAL

ROTARY KILNS AND DRYERS:

3—Rotary Kilns, 6'x60', made by Bonnot Co. Each with ½" shell, all supporting bases, stack seals, firing hood, complete. By installing lifting flights these kilns would also make excellent heavy duty dryers. Will be sold with or without 3'x50' Rotary Cooler for each kiln.

2—Rotary Kilns; 7'x120' Vulcan Iron Works, 8'x135'.

3—Direct Heat Rotary Dryers, 2—5'x 40' single shell, Ruggles-Coles. Also 2'7"x10' Roto-Louvre.

RAYMOND PULVERIZERS:

3—#5047 Raymond High Side, 4 rolls, each equipped with Raymond "whizzer" air separator, oil journals, having 7½" face rolls, Raymond exhauster, cyclone collector and all inter-connecting piping.

2—#5047 Raymond High Side, each with double cone vacuum air classifier, #11 Raymond exhauster, cyclone collector, full inter-connecting piping and 2—50 H.P. 3/60/2200 volt motors—one for the mill and the other for the exhauster.

1—#5057 Raymond High Side, 5-rolls, with double cone vacuum air classifier for products up to 99.9% minus 325 mesh; with oil journals, Raymond exhauster, cyclone collector, inter-connecting piping.

FILTERS:

4—#12 Sweetland Filters for 36 leaves on 4" c/c, 502 sq.ft. f.a., one without leaves; one for 72 leaves on 2" c/c, 1004 sq.ft. f.a.

BALL AND TUBE MILLS:

4—Traylor Tube Grinding Mills, silex lined, 5'x22', with herringbone steel gears; 5'x20', 4'6"x18'6"; 4'6"x14.'

8—Pebble Mills, porcelain lined, 5' dia. x 4'; 3—6'x8', 800 gals. each.

2—UNUSED 18"x28" Bird solid bowl Stainless Steel Continuous Centrifugals:

2—Centrifugal Air Classifiers; 16' Raymond, 16' Sturtevant.

6—Devine #28 Vacuum Shelf Dryers, each 20 shelves 59" x 78", Condensers & Pumps.

12—Shriver 42" x 42", C.I. Filter Presses, P & F, 18, 27, 36, 54 chambers.

18—Sperry 18" x 18", C.I., P & F, Filter Presses, closed delivery, 11 chambers.

IN STOCK AT OUR NEWARK WAREHOUSE

4—300 gal. Baker Perkins jack. Mixers.

5—Direct Heat Rotary Dryers, Class XA 4' x 20'; 4'6" x 25' sgl. shell; 5' x 40'; all Ruggles Coles.

1—42" Amer. T & M Co. S/S Centrifugal, 40 HP motor, suspended type.

1—Tolhurst 40" Monel Centrifugal, susp. type.

1—Allis Chalmers 4'6" x 7' Gall Granulator, iron lined. Used 100 hours.

1—Hardinge Rotary Classifier, 6' x 14'. Also for scrubbing or dewatering.

3—Mikro Pulverizers, 2TH, 2SI, 4TH.

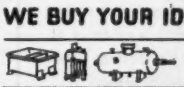
1—Aluminum Sperry Filter Press, 30" x 30", 45 chambers.

2—700 gal. closed, jack., kettles, with Simplex Turbo Mixers, reduction drive, m.d.

2—500 gal. steel jack, closed, agitated Vacuum Reactors, 125# jacket.

ONLY A PARTIAL LIST. SEND US YOUR INQUIRIES.

WE BUY YOUR IDLE EQUIPMENT



SINGLE ITEMS

COMPLETE PLANTS

SEND US YOUR LIST TODAY!

CONSOLIDATED PRODUCTS CO., INC.

LARGEST AND OLDEST DEALER IN REBUILT PROCESSING EQUIPMENT

2015 PARK ROW BLDG., NEW YORK 38, N. Y., BArclay 7-0600, Cable Address: EQUIPMENT, N. Y.

The GELB GIRL Salutes CHEMICAL ENGI

CONGRATULATIONS ARE IN ORDER . . .

This issue tells the story of the growth of Chemical Engineering in a way we never could —so we won't presume to say anything but — "Congratulations!"

Speaking of growth, we'd like to (modestly) remind our readers that while "Chemical Engineering" is celebrating 50 years, we've been in business for 66.

If "long life" means anything, that should mean something to you. But in the final showdown, it's not how long you've been at it, but what you've done and where you've got to, that matters worth a hoot.

We're content to let our present business, built up for 66 years, speak for itself. You know the old saying about the proof of the pudding . . . well, this issue of "Chemical Engineering" and our own standing in the field is evidence of established leadership that needs no further proof.

Edw. Gelb

1—Sharples Stainless Steel Super D Canter #PN-14.
2—Buflovak Vacuum Shelf Dryers, 20 Shelves, Size of Shelves 5' x 160".
1—Sparkler Monel Jacketed Filter, Model #33-S-26.
1—Sperry Aluminum 42" Plate & Frame Filter Press, 34 Chambers, Closed Delivery, 3" Frames (Unused).
1—Combustion Engr. Stainless Steel Jacketed Vacuum Autoclave, 488 Gals. Cap., 300 PSI Internal—75 PSI Jacketed, with Tube Bundle, ASME Constructed.

2—Mikro Stainless Steel Atomizers, #5 & #6.
1—Pfaudler Glass Lined Condenser, 14 sq. ft.
1—Fuller Model C-200 Compressor.
1—Nash Compressor, Model #H-7 with 150 HP Motor.
3—A. T. & M. Stainless Steel Centrifuges, Suspended Type, 48"x54".
1—Fletcher Underslung Centrifuge, 20" Steel Imperforated Basket.
2—Fletcher 40" Centrifuges, Centerslung Bronze Perforated Basket.
1—Fletcher 48" Centrifuge, Centerslung Bronze Perforated Basket.
1—Tolhurst Stainless Steel Suspended Type Centrifuge, 40" Imperforated Basket.
1—Monel Bubble Cap Column, 3'x9', 5 Plates.
1—Buflovak Double Drum Dryer, 32"x90".
2—J. P. Devine Vacuum Shelf Dryers, 5 & 9 Shelves.
1—J. P. Devine Vacuum Drum Dryer, 5'x25'.
3—Buflovak Double Drum Dryers, 5'x12'.
1—Louisville Rotary Steam Tube Dryer, 6'x50'.
1—Ruggles Cole Rotary Kiln, 7½'x60'.
1—Stokes Vacuum Shelf Dryer #138H-12, 12 Shelves.
1—Royle #5 Perfected Extruder with 125 HP Motor.
2—Downington Stainless Steel Heat Exchangers, 500 sq. ft. each.
10—Steel Heat Exchangers, 100-1000 sq. ft.
3—Sweetland Filters, #2, 5 & 7.
1—Bird Stainless Steel Filter, 18"x28".
1—Sparkler Steel Jacketed Filter, Model #33-D-7.

1—Oliver Rotary Experimental Steel Filter, 3'x1'.
1—Vallez #3B Filter.
1—Sweetland #12 Filter, 30 Leaves.
2—Shriver 36"x36" Cast Iron Plate & Frame Filter Presses, 25 Chambers, Closed Delivery, Side Feed.
1—Shriver 36"x36" Cast Iron Plate & Frame Filter Press, 49 Chambers, Closed Delivery, Steam Jacketed.
1—Shriver 24"x24" Stainless Steel Jacketed Filter Press, 10 Chambers, Closed Delivery, 4 Eye, Washing Type.
1—Shriver 42"x42" Evedur Plate & Frame Filter Press, 40 Chambers, Closed Delivery.
1—Shriver 18"x18" Plate & Frame Filter Press, 15 Chambers, Open Delivery.
1—Sperry 42"x42" Cast Iron Plate & Frame Filter Press, 18 Chambers, Closed Delivery.
1—Sperry 12" Filter Press, Type 41, 20 Chambers, Closed Delivery.
1—Sperry 12" Filter Press, Type 41, 12 Chambers, Closed Delivery.
1—Pfaudler Glass Lined Jacketed Kettle, 150 Gals., Series M.
1—Pfaudler Glass Lined Jacketed Vacuum Reactor, 500 Gals., Series LL.
1—Pfaudler Glass Lined Jacketed Vacuum Reactor, 50 Gals., Series P, 125 PSI Internal—75 PSI Jacketed with Impellor Agitator.
2—J. P. Devine Steel Jacketed Vacuum Kettles, 2,000 Gals. Cap. Ea.
10—Steel Vacuum Reactors with Coils, 1300 Gals. Cap., 80 PSI.
1—Nickel Jacketed Kettle, 10 Gals. Cap.
1—Nickel Jacketed Kettle, 500 Gals. Cap.
1—Evedur Vacuum Kettle, 2,000 Gals. Cap.
1—Nickel Jacketed Vacuum Kettle, 400 Gals. Cap.
1—Stainless Steel Jacketed Vacuum Reactor, 550 Gals. Cap.
1—Stainless Steel Jacketed Vacuum Reactor, 180 Gals. Cap. with Agitator & Drive, ASME Constructed.
1—Stainless Steel Jacketed Vacuum Kettle, 50 Gals. Cap. 50 PSI Jacketed.
20—Stainless Steel Jacketed Kettles, 380 Gals. Cap. Each.
2—Groen Stainless Steel Jacketed Kettles, 20 & 50 Gals. Cap.
1—Pfaudler glass Lined Jacketed Reactor, 500 Gal., Series R.
1—Pfaudler Glass Lined Jacketed Experimental Kettle, 2 Gal. Cap.
1—Pfaudler Glass Lined Jacketed, Vacuum Reactor, 200 Gal.

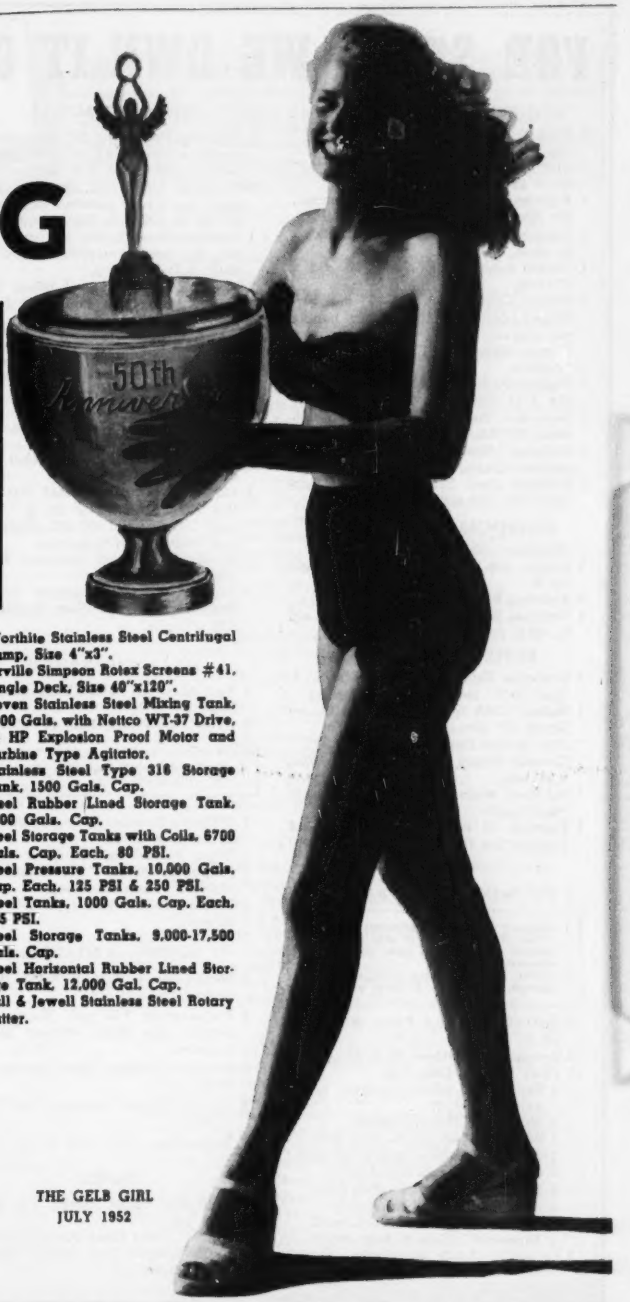
Established 1886

R. GELB & SONS, Inc.,

CHEMICAL, RUBBER, OIL, PLASTIC and FOOD PROCESSING MACHINERY

STATE HIGHWAY No. 29, UNION, N. J. • UNionville 2-4900

NEERING



THE GELB GIRL
JULY 1952

1—A. T. & M. 30" Stainless Steel Centrifuge, Perforated Basket, Underdriven.

1—A. T. & M. 40" Centrifuge, Centerslung Rubber Perforated Basket.

1—Tolhurst 14" Centrifuge Rubber Perforated Basket.

1—Tolhurst 36" Centrifuge, Centerslung Steel Perforated Basket.

1—Tolhurst 26" Centrifuge, Centerslung Rubber Perforated Basket.

1—Stainless Steel High Pressure Hydrogenator, 360 Gals. Cap., Working Pressure 250 PSI.
1—Blaw-Knox Steel Jacketed Autoclave, 6'x13'.
1—Blaw-Knox Autoclave, 2 Gals. Cap., with Anchor Type Agitator.
2—Patterson Jacketed Vacuum Autoclaves, 4'x10'.
10—Baker Perkins Steel Jacketed Mixers, Sigma Blades, 250 Gals. Cap.
2—J. H. Day Mogul Mixers, 2½ & 5 Gals. Cap.
1—J. H. Day Stainless Steel Jacketed Mixer, 50 Gals. Cap. with Sigma Blades.
1—J. H. Day Jacketed Powder Mixer, 5000 Lbs.
1—Readco Lab. Jacketed Vacuum Mixer, 2½ Gals. Cap. with Sigma Blades.
1—Readco Stainless Steel Jacketed Double Arm Mixer, Sigma Blades, 225 Gals. Cap.
4—Turbo Steel Jacketed Mixers, 700 Gals. Each.
18—Simpson #0 Intensive Mixers.
1—Mikro #1-SH Pulverizer.
1—Mikro #2-TH Pulverizer, Stainless Steel & Bronze Construction.
1—Mikro #3-TH Pulverizer with 30 HP Motor.
1—Mikro Bantam Pulverizer with Motor.
1—Gruendler Pulverizer with 30 HP Motor.
1—Fitzpatrick Model D Comminuting Machine, Stainless Steel & Bronze Construction.
3—Oliver Stainless Steel Centrifugal Pumps, Size 1½".

1—Worthite Stainless Steel Centrifugal Pump, Size 4"x3".
2—Orville Simpson Rotex Screens #41, Single Deck, Size 40"x120".
1—Koven Stainless Steel Mixing Tank, 1000 Gals. with Nettco WT-37 Drive, 20 HP Explosion Proof Motor and Turbine Type Agitator.
1—Stainless Steel Type 316 Storage Tank, 1500 Gals. Cap.
1—Steel Rubber Lined Storage Tank, 4500 Gals. Cap.
2—Steel Storage Tanks with Coils, 6700 Gals. Cap. Each, 80 PSI.
2—Steel Pressure Tanks, 10,000 Gals. Cap. Each, 125 PSI & 250 PSI.
3—Steel Tanks, 1000 Gals. Cap. Each, 125 PSI.
25—Steel Storage Tanks, 9,000-17,500 Gals. Cap.
1—Steel Horizontal Rubber Lined Storage Tank, 12,000 Gal. Cap.
1—Ball & Jewell Stainless Steel Rotary Cutter.

Established 1886

R. GELB & SONS, Inc.,

CHEMICAL, RUBBER, OIL, PLASTIC and FOOD PROCESSING MACHINERY

STATE HIGHWAY No. 29, UNION, N. J. • UNionville 2-4900

FOR SALE—WE OWN IT OR CONTROL IT!

COLUMNS—STILLS

2 Aluminum Bubble Cap Columns, 36" dia. x 45 plate.
1 Aluminum Bubble Cap Column, 27" dia. x 18 plate.
1 Aluminum Perforated Plate Column, 28" dia. x 36 plate.
1 Copper Bubble Cap Column, 42" dia. x 31 plate.
1 Copper Bubble Cap Column, 30" dia. x 22 plate.
1 Copper Column with 18—30" dia. perforated plates and 10—24" dia. bubble cap plates.
1 Copper Sieve Plate Column, 30" dia. x 22 plate.
1 Copper Perforated Plate Column 24" dia. x 14 plate.
1 Steel and Cast Iron Bubble Cap Column, 30" dia. x 62 plate.
1 Stainless Steel T316 Raschig Ring packed column, 24" dia. x 6'8" high.
1 Stainless Steel T316 direct fired Vacuum Still, 325 gal.

CONDENSERS—EXCHANGERS

3 Aluminum tub. 166 sq. ft.
6 Copper tub. 65, 75, 95, 330, 420, 487 sq. ft.
2 Stainless Steel tub. 8½ x 39 sq. ft.
4 Stainless Steel Coil Condensers, 40 sq. ft., 60# pr.

DRYERS—EVAPORATORS

1 Louisville Rotary Steam Tube Dryer, 5' dia. x 20'6" long; with screw press.
1 Stokes #39A Jacketed Vacuum Rotary Dryer, 18" dia. x 42" long.
2 Atm. Double Drum Dryers, 22" x 38".
1 Cummer Rotary Hot Air Dryer, 46" dia. x 26' long.
1 Struthers Wells Evaporator, 100 sq. ft. tube bundle.
1 Pfaudler 60 gal. Glass Line Jacketed Evaporating Dish.

FILTERS

3 #10 Sweetland. #2 & #10.

1 Swenson Rotary Continuous Vacuum Filter; Precoat type, 8' dia. x 8' face, rubber covered and lead acid proof construction.
1 FEINC Rotary Vacuum Filter, string discharge, 4'6" dia. x 6' face, aluminum.

1 Ertel Bronze Disc Filter, EX-40; 90 sq. ft.
4 Pressure Leaf Filters, 70 to 90 sq. ft.
15 Filter Presses, Cast Iron:
4 Shriver 36" rubber covered, closed dely., washing.
1 Shriver 30" rubber covered.
1 Shriver 30", 35 rec. pl., open dely.
1 Shriver 24", 40 ch., open dely., wash.
1 Shriver 24", 24 ch. closed dely.
1 Sperry 24", 15 rec. pl., open dely.
1 Shriver 24", 28 ch., closed dely.
1 Shriver 24", 23 ch., cl. dely., wash.
1 Shriver 24", 12 ch. cl. dely., wash.
2 Louisville 8-roll Continuous Grains Presses, 24" and 36" wide.

KETTLES—REACTORS

1 Stainless Steel, Type 347 Autoclave or pressure tank; 250# pr., Elec. heated 850° F; 17¼" dia. x 9' high.
70 Stainless Steel and Stainless Clad open top, steam jacketed kettles—10, 40, 60, 80, 100, 150, 250, 500 gal. sizes.
1 Stainless Steel Kettle, 950 gal., 20# jkt. pr., vertical agitator, Type 347 shell, bolted C.I. top.
2 150 gal. Stainless Steel Steam Jacketed Kettles, open top, with double motion agitators.

1 200 gal. Reed Stainless Steel Jacketed Kettle, open top, double motion agitator, 10 HP motor.

1 3000 gal. Horiz. Steel Cooker, Vacuum, Agitated.
1 2000 gal. Vertical Steel Cooker, agitated.
2 1500 gal. Vertical Jacketed Steel Kettles, 100# int. pr., 80# jkt. pr.
1 Lead Lined Kettle, 500 gal., closed top, with coils, jacket & agitator.
1 Aluminum 100 gal. Reaction Kettle, Jktd. & Agit.
2 Copper Jacketed Agitated Vacuum Kettles, 4' dia. x 4' deep, double motion agitator.

MILLS—PULVERIZERS

2 Paul Abbe #6 Pebble Mills, porcelain lined, 32" x 36".
1 Abbe #4A Pebble Mill, 45" x 48".

1 Hardinge Conical Ball Mill, Steel Liner, 4'6" dia. x 24" long.

1 Williams Hammer Mill, type AK; size A, stainless steel.
2 Mikro Pulverizers, #2-SI. & #2-TH.
1 Fitzpatrick Model "D" Comminuting Machine, Stainless Steel.
1 Premier Colloid Mill, type U-3, 6" st. st. rotor.

MIXERS—AGITATORS

1 Porter heavy duty jacketed double worm mixer—75 gal.
1 Dellenberger 100 gal. Heavy Duty Double Arm Mixer, fish-tail blades, jacketed.
1 Broughton Powder Mixer, double arm, 50 cu. ft.
10 Copper Conical Blenders, ½, 1, 7 & 11 cu. ft.
1 Turbo Mixer, #3B, with 7½ HP motor.

TANKS

5 Aluminum Tanks, closed, 275, 500 & 1350 gal.
2 100 gal. Glass Lined Vacuum Tanks.
22 Horiz. Welded Steel Tanks, Lastiglas Lined, 15,200 gal.
3 Horiz. Welded Steel Tanks, Lastiglass Lined, 5800 gal.
18 Vertical Welded Steel Tanks, closed Mammut Lined, 7700 gal., 7000 gal. & 2300 gal.
1 Steel Yeast Tank, 2050 gal., copper coils.

5 Vertical Jacketed Pressure Tanks—steel—30# steam jacket—6mm vacuum internally:
3—34" ID x 15' H (approx. 700 gal.)
1—23" ID x 10' H (approx. 230 gal.)
1—23" ID x 9' H (approx. 195 gal.)

1 Vertical Rubber Lined, 6000 gal.

STAINLESS STEEL TANKS IN STOCK

1 16,200 gal. Vert., closed, T304—NEW
1 5700 gal. Horiz., T302—NEW
1 4200 gal. Vert., closed, T304—NEW
1 2350 gal. Vert., open, T302—NEW
1 1400 gal., Vert., open, 10' L x 57" W x 57" D
2 1000 gal. Vert., T304—NEW
2 500 gal. Vert., T304—NEW
40 Stainless Steel Tanks—from 6 gal. to 450 gal. sizes.
2 3000 gal. Horizontal Stainless Steel Tanks, 5'4" dia. x 18'9" long, insulated and agitated. Excellent for transporting, storage or holding.

MISCELLANEOUS

1 Bird Suspended, 48" Steel Centrifugal, Perforated basket; Bottom discharge.
1 Fletcher 30" Jr. Centrifugal Extractor, St. St. Imperf. basket.
1 Sharples #16 Super Centrifuge, stainless steel.
1 Spencer Turbine Co. Gas Booster or Compressor, stainless steel, 30 HP motor, 600 CFM at 80 oz. pr.
1 DeIonizing System, 500 GPH. Zeolite.

2 Kux Machine Co. Model 25 Rotary Pellet Presses, 21 and 25 punch—with motor and vari-drive.

6 Stokes Rotary Pellet Presses, 16 punch, B-2, D-3, D-4.
1 Byron Jackson Deep Well Pump, 150 GPM 325' head, NEW.
3 Selectro Vibrating Screens, stainless steel, 2' x 7', double deck, enclosed.
1 Stainless Steel Horizontal Sterilizer or Steam Retort, 10# pr., 24"W x 26"H x 36"L.
1 Stokes Vertical Steel Jacketed Vacuum Chamber and Impregnating tank, 30"L x 24"W x 24"D.

STAINLESS STEEL FABRICATION

We have in stock a quantity of Stainless Steel sheets: Type 304—12 ga., 14 ga., and 10 ga. Tanks, receivers, etc. fabricated to your specifications.
Write: Attn. Fabricating Division.

BOTTLING · CANNING · PROCESSING
MACHINERY PERRY SUPPLIES

PERRY EQUIPMENT CORP.

1413 N. 6th ST.
PHILA. 22, PA.

PHONE
STEVENSON 4-7210
CABLE—PERI

A BRILL BUY ... IS THE BEST BUY

"BRILL FILLS THE BILL" . . . OUR QUARTER CENTURY OF DISTINGUISHED SERVICE TO INDUSTRY IS YOUR ASSURANCE OF TOP VALUES, UTMOST QUALITY AND DEPENDABILITY!

SPECIALS

1—8' x 135', 5/8" shell, Rotary Kiln, 2-14" tires complete.
2—Oliver monel 8' x 10' Rotary Vac. Filters.
1—Rogers Spray Dryer 16' dia. with all accessories.
2—Pfaudler 100 gal. glass-lined Stills with condensers, receivers.
4—Steel 2000 gal. jacketed, agitated, 200 psi Reactors.
1—Pfaudler 350 gal. glass-lined, jktd. agitated Reactor.
3—Dopp 250, 150 gal. jacketed, agitated kettles.
1—Quadruple Effect Evaporator, brass tubes 16,000 sq. ft.
1—Buflovak VRC, stainless steel Single Effect Evaporator 94 sq. ft.
1—Swenson Quadruple Effect Evaporator S.S. 2600 sq. ft.
1—Buflovak 6' dia. Vacuum Crystallizer.
2—NEW Absorption Towers, 13,500 gal. cap.
1—Vertical Storage Tank 30' dia. 28' high, 135,000 gal
12—Tubular Condensers 200 to 1000 sq. ft.

DRYERS—KILNS

1—Vulcan 8' x 135', 5/8" shell, 2-14" tires, complete.
1—Vulcan 8' x 115', 5/8" shell, 2-14" tires, complete.
1—Vulcan 7' x 120', 5/8" shell, 2-12" tires, complete
1—Allis-Chalmers 10' x 90', 9/16" shell, 2-14" tires, complete.
1—6' x 60', 3/4" shell, 2-8" tires, complete.
1—Link Belt 11'6" x 35' Roto-Louvre with hoods, blower, etc.
2—Link Belt 2'7" x 8' monel, 2'7" x 10' steel, Roto-Louvre Dryers.
6—Rotary Dryers 7' x 70', 7' x 60', 5' x 67', 4'6" x 40', 4' x 25'.
3—Louisville Rotary Steam Tube Dryers 6' x 30', 6' x 30', 3' x 20'.
2—Devine 17 shelf double door Vacuum Dryers 59" x 78".
3—Buflovak 20, 15, 7 and 5 Shelf Vacuum Dryers 42" x 42".
5—Stokes & Buflovak Rotary Vacuum Dryers 30" x 8', 3' x 15', 6'6" x 38'.
1—Blaw-Knox Stainless Steel Rotary Vac. Dryer 42" x 8'.
3—Buflovak 42" x 120", 32" x 100", 32" x 90" Atmospheric Double Drum.
1—Single Drum 60" x 80" Flaker.
1—14 Truck steam heated Dryer 1680 sq. ft.

FILTERS

6—Vallez Pressure Filters 360 and 540 sq. ft.
1—Sweetland #12 with 36 leaves.
1—Sweetland #10 with 36 steel leaves.
1—Sweetland #7 with 27 steel leaves.
8—Oliver Rotary Vacuum 11'6" x 14', 8' x 12', 8' x 10', 8' x 8', 5'3" x 6', 3' x 4', 3' x 1'.
3—Eimco Rotary Vac. 8' x 8', 4' x 5', 4' x 4'.
1—Oliver Rotary Vacuum Pressure Filter 3' x 4' steel.
1—Oliver 8' x 8' Rotary Precoat Filter, rubber-lined.
1—Feinc Rotary Vacuum 8' x 12' steel with drive, etc.
4—Shriver 36" P&F, 30 chambers, c.i., closed delivery.
1—Sperry 36" Recessed, 48 chambers, C.I., open delivery.
5—Shriver 30" P&F, 30 chambers, C.I., open delivery.
8—Sperry 24" P&F, 16 chambers, C.I., closed delivery.
1—Shriver 24" Recessed, 30 chambers, C.I., open delivery.
3—Shriver 18" Recessed, 30 chambers, C.I., open delivery.
2—Sperry Aluminum 30" and 24" P&F, 22 and 28 chambers.
1—Shriver Aluminum 12" P&F, 8 chambers.

CENTRIFUGALS

1—Tolhurst 48" suspended, bottom discharge, rubber covered.
1—Tolhurst 48" Center Slung S.S., perforated basket.
1—AT&M 42" Suspended S.S., bottom discharge, perforated.
6—AT&M 40" Bronze Baskets, bottom discharge, perforated.
1—Fletcher 40" Suspended, Bottom Discharge, S.S., perforated basket.
1—Tolhurst 40" center slung, rubber covered, perforated.
2—Sharples C27, C20, 316 S.S. Super-D-Hydrators.
1—Tolhurst 32" Suspended Monel, bottom discharge, perforated.
2—Bird 36" x 50" solid bowl, stainless.
1—Sharples P14 S.S. Super-D-Canter.
4—Sharples #16 S.S. and steel.

PULVERIZERS

3—Raymond 5 roll, 4 roll High Side Mills complete.
1—Bauer 36" Attrition Mill 2-50 HP motors.
17—Patterson, Abbe Pebble & Ball Mills 60 to 1000 gals.
2—Premier Colloid Mills 8" dia., S.S.
1—Eppenbach QV7 Colloid Mill.
2—Jeffrey 36" x 24", 20" x 12" Hammer Mills.
2—Raymond 12', 4' Separators.
1—2 Roll Rubber Mill 6" x 12".
2—Mikro No. 1SI Pulverizers, 5 HP motors.
1—Fitzpatrick Comminuting Mill 5 HP.

SCREENS

1—Selectro S.S. double deck 4' x 10'.
5—Sprout Waldron S.S. single deck, 40" x 84".
1—Robinson Single Deck 40" x 104".
1—Tyler Hummer 4' x 7' Single Deck.
5—Tyler Hummer 3' x 5' Triple Deck.
1—Abbe #2 Bluttergess Sifter.

MIXERS—ALL TYPES

7—Baker Perkins 200, 100, 20, 9 and ½ gal., jacketed, double arm, sigma blades.
1—Baker Perkins 300 gal. Unidor S.S.
1—Baker Perkins 2 gal. Stainless.
1—Baker Perkins, type JNM, 100 gal., jacketed, double arm.
1—Day 30 gal. Imperial jacketed, double arm.
10—Day 200# to 3000# Powder Mixers.
12—Electric, Portable Agitators ¼ HP to 5 HP, NEW.
4—Day, Ross, 8 and 50 gal. Pony Mixers.

MISCELLANEOUS

20—Bucket Elevators, steel housings, 34' to 90' centers, 8" x 5" to 24" x 8" buckets.
7—Stokes Vacuum Pumps 15 to 100 CFM.
1—Milton Roy Proportioneer Pump, S.S. and Hastelloy, 10 GPM.
5—Devine, Buflovak Condensers and Receivers, 20 to 90 sq. ft.
7—Groen 150, 125 gal., S.S., jacketed, agitated, kettles.
4—Stokes DD2, D4 Rotary Tablet Machines.
5—39" dia. Stainless Steel Revolving Pans.
1—Nash Hytor Vacuum Pump 440 CFM.
10—Olivite, Duriron, Rubber, Durimet and Haveg Centrifugal Pumps 1½" to 4".

Write, wire or telephone for complete information

BRILL EQUIPMENT COMPANY
Member American Rebuilders Association
2401 THIRD AVENUE • NEW YORK 51, N. Y.
Telephone: CYPRESS 2-5763 • Cable: BRISTEN, N. Y.

BE CO. BRILL EQUIPMENT COMPANY
"A SINGLE ITEM . . . OR A COMPLETE PLANT"

Rebuilt For New Machine Accuracy
At Tremendous Price Reductions

UNION Rebuilt Machinery Established 1912

International Stainless Steel Straightline Vacuum Filler, 160 per minute.

Resina S and LC Automatic Cappers.

Capem E4F 4-Head Rotary Capper.

Island Equipment Styline Automatic Bottle Unscrambler.

CRCO New Way MH Wraparound Labeler.

S. & S. G1, G2, G6 Auger Fillers.

Stokes and Smith Model HG88 Duplex Auger Powder Filler.

Colton 2 and 3RP Rotary Tablet Machines.

Stokes 2C Cream Filler and Closer.

Triangle Package Elec-Tri-Pak G2C, G2S, A2C, N2CA and A6CA Fillers.

Filler 4 Head Stainless Steel Filler.

Horix S. S. 14-head Rotary Filler.

Standard Knapp No. 429 Carton Sealer.

Mikro 4TH, 3TH, 1SH Pulverizers; Jay Bee U1, Schutz O'Neill Mills.

Tri-Home #5 Colloid Mill, 7½ HP.

3500 gal. working cap. Steam Jacketed, Double Arm Mixing Tanks for mixing, storing or processing of your materials.

B. P. 150 gal. Unidor S. J. D. A. Mixer.

Stokes, Day, New Era, Hottman Mixers, from 2 to 450 gals., with and without Jackets, Single, Double Arm Agitators.

Baker Perkins and Readco Heavy Duty 5 to 150 gals. Double Arm Jacketed Mixers with Sigma or Fish Tail Blades.

Ross, Day, Pony Mixers, 8, 15 gal. caps.

Day 100, 800, 1500, 2500 lbs. Dry Powder Mixers and Sifters.

Acme 150 gal., and Lee 85 gal. S. S. Jacketed Mixing Kettles.

Huhn Steam and Gas Fired Rotary Dryers.

J. E. and Lehman 3 and 5 Roll Mills.

Allis Chalmers, Great Western Sifters.

Pony M, ML Labelrites; World Rotary Straightaway Labelers.

Pneumatic Scale Cartoning Line, 60 and 30 per minute.

Miller, Scandia, Hayssen Wrappers.

Campbell Auto. Cellophane Wrapper.

Package Machy. Co. FA4, FA Wrappers.

Act Now For Choice Buys

Tell Us All Your Machinery Requirements

Immediate Deliveries

UNION STANDARD EQUIPMENT CO.

318-322 Lafayette Street New York 12, N. Y.

AIR COMPRESSORS VACUUM PUMPS

NEW & REBUILT

FOR 50 YEARS AMERICAN

TRY THE BEST YOU'LL LIKE THEM TOO—

SALE RENT

RENTAL—PURCHASE TRADE-IN

Stationary — Portable

Steam — Gas — Diesel

Electric

GUARANTEED PERFORMANCE

AMERICAN AIR COMPRESSOR CORP.

NORTH BERGEN NEW JERSEY

HAVE YOU TRIED OUR NEW MACHINERY DIVISION?

QUICK DELIVERY

NEW—Steel or S.S. Reactors From 50 gals.—UP

NEW—Steel or S.S. Ribbon Mixers—all sizes

NEW—Steel or S.S. Jacketed Kettles—all sizes

NEW—Steel or S.S. Tanks—all sizes

Send Us Your Specifications

Send Us YOUR Inquiries For Rebuilt Equipment

WHAT HAVE YOU FOR SALE

for BETTER BUYS & SERVICE

Phone SOuth 8-4451—9264—8782

You can BANK on

EQUIPMENT CLEARING HOUSE, INC.

289-10th ST. BKLYN 15, N. Y.

For Sale **For Sale**

1—Eppenbach Stainless Steel Home Mixer, complete with a 7½ HP Explosion-Proof Motor.
1—Baker-Perkins 100 Gal. Stainless Steel Mixer, double-arm, sigma blades, with 20 hp explosion-proof motor.
1—J. H. Day #2, 75 Gal. Brighton Mixer.
5—Pebble Mills 40 to 500 Gal.
10—Pony Mixers, 8, 15 and 40 Gal.
HIGH SPEED Roller Mills 9"x24" to 18"x40".
1—Motor Driven Belt Conveyor.
3—6" Premier Colloid Mills, watercooled.
2—#281 Mikro-Pulverizers with 10 hp Motors.

SPECIALIZING IN REBUILT MACHINERY

Irving Barcan Company

249 ORIENT AVE.

JERSEY CITY 5, N. J.

Phone—DElaware 2-4695-6

FOR SALE

30 H.P. Kewanee Scotch Mar. Boiler, oil fired.
50 H.P. York Steam-Pak Boiler, oil fired.
3—32"x30" Sutlovak Double Drum Dryers.
100 to 200 gal. S.S. Mix Tanks, water jkt.
3000 gal. S.S. Truck Tanks, Trailerized.
75 gal. Monel jkt. Kettle, 35"x27", agit.
100 gal. S.S. Clad jkt. Kettles, 30"x32".
150 gal. S.S. jkt. Kettle, 42"x36", agit.
380 gal. Pfaudler Horiz. Glass Lined Tank, 25#.
4—50 gal. Steel Kettles, 75# jkt., A.S.M.E.
Gruendler Jr. Pulverizer, 10 H.P.
75 to 1500 gal. Homogenizers or Viscolizers.
26" Centrifugal Extractors, copper baskets.
60" Centrifugal Extractors, s.s. baskets & curbs.
Model 148C Stokes High Vacuum Pump, 1½ H.P.
2" S.S. Centrifugal Pump, 5 H.P.
Hobart Grinder, 1½ H.P.

Send us your inquiries

LESTER KEHOE MACHINERY CORP.

1 East 42nd Street. New York 17, N. Y.

MUrray Hill 2-4616

STEEL STORAGE TANKS

18—8000 & 10,000 Gal. R.R. Tanks.
6—20,000 gal. New 5/16 Inch Horiz.
22—10,000 & 15,000 Gal. ½ Inch Horiz.
9—2500, 5000 & 10,000 Bbl. Vert.

L. M. STANHOPE, Rosemont, Penna.

FOR SALE

1—42" x 16" Allis-Chalmers crushing rolls.
1—36" x 16" Sturtevant crushing rolls.
2—24" x 14" Rogers crushing rolls.
1—6' Raymond Whizzer separator.
15 Tons of 1½" to 2" Manganese Steel balls.
5 x 50', 7½' x 60', 7' x 60', 6' x 60', 5' x 25', 4' x 40' and 3' x 30' dryers.
New dryers and kilns.

W. P. HEINEKEN

50 Broad St. Tel. Whi. 4-4236 New York 4, N. Y.

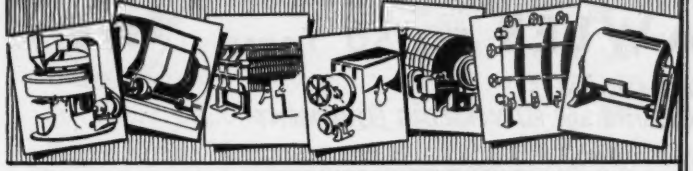
REFRIGERATION UNIT

275-ton Ingersoll-Rand barometric steam jet refrigeration unit, fully comp. with pumps, motors, and all access. equip. New 1943, used 2 yrs., condition like new. Detail specif. and price will be mailed on request.

PHILADELPHIA TRANSFORMER CO.

2829 Cedar St. Phila., 34, Pa.

MID-YEAR INVENTORY



FMC

Congratulations to

CHEMICAL ENGINEERING

on its

50th BIRTHDAY

We, too, have served the chemical industry

Now celebrating our

25th ANNIVERSARY

This is only a partial listing. Send for complete Bulletin No. 652

AUTOCLAVES (Includes Vulcanizers, Sterilizers, Retorts, Pressure Vessels)

Steel Horizontal Autoclaves or Retorts: 66" dia. x 147" long
Climax Rectangular Sterilizer; fully jacketed; 48" x 42" x 96"
Steel Jacketed Digester: 2800 Gal. 6'7" x 11'5"
Steel Jacketed Rotary Digester; 9'6" x 12'; 100 PSI ASME
A. O. Smith Welded Steel (2") Pressure Tanks; 8' x 40' and 10' x 40'
Acid Proof Tile Lined Autoclaves: 6'10" x 14' with cone tops and bottoms; 3375 gal. 100 PSI
Rubber Lined Steel Pressure Tanks; 40,000 Gal. 11' x 56' 50 PSI ASME
Steel Autoclave; 5' x 26'; coil heated with tracks, vac. pump and receiver
Steel Autoclave; 6' x 21'; 300 PSI; Jacketed and Agitated
Steel Vulcanizer 6' x 26'; 125 PSI with tracks and trucks
Biggs Vulcanizer 8' x 14'; 110 PSI, ASME; quick opening door

BALL AND PEBBLE MILLS

International Type X24 Porcelain Lined Pebble Mills: 8' x 8' with 50 HP, gear-motors; also size 6' x 6'
Abbe Buhrstone Lined Pebble Mills: 4'6" x 5'; P.D.
Abbe Buhrstone Lined Pebble Mills: 5' x 6'
Abbe Buhrstone Lined Pebble Mill; 32" x 36" with 2 HP Motor
Patterson Buhrstone Lined Pebble Mill; 6' x 10' with 10 HP
H. K. Porter Porcelain Lined Pebble Mill; 5' x 6' with 25 HP
Patterson Chrome Manganese Tube Mill: 3' x 10' with air-classifier
Allis Chalmers Tube Mill: 60" x 22"; silica brick lined
Kennedy-Van Saun Ball Mill; 4' x 8' with Herculite liner
Hardinge Conical Ball Mill; 10' x 36" with Feedometer, etc.
Hardinge Conical Ball Mill: 4'6" x 24" with 30 HP
Hardinge Conical Ball Mill: silica block lined; 8' x 36"

COLLOID MILLS (Includes Homogenizers)

Premier Stainless Steel 3" rotor Type UBS with 5 HP motor
Eppenbach QV8" Colloid Mill with 5 HP motor
U.S. L2 Stainless Steel 3½" Mill with 2 Motors 3 HP
Premier Stainless Steel 8 U4 Colloid Mill with 20 HP
Manton Gaulin Stainless Steel Homogenizer with 40 HP
Premier Type U3-10" S.S. Colloid Mill with 30 HP
Premier L 15 . . . 15" Colloid Mill with 30 HP motor
Premier Type U3 with 10" Stellite Rotor-30 HP motor
Premier 15" Ni Resist Colloid Mill with 75 HP motor

CRYSTALLIZERS

Swenson Walker Horizontal Crystallizers 40' units
Swenson Jacketed Crystallizers: 24" x 10' and 12'; 5 HP
Buffalo 6' Jacketed Vacuum Crystallizer
10 Horizontal Crystallizers; 10' dia. x 13' and 10' x 15'; Steel Shell 7/16" thick

DRYERS—Tray Type—Shelf Type

Buffalo Vacuum Chamber Dryer; 20 shelves 40" x 42" with vacuum pump, condenser, receiver, etc.
Two Buffalo Vacuum Shelf Dryers; 20 shelves 60" x 160"; double door with Vacuum Pump, Condenser, Receiver, etc.
Devine Vacuum Chamber Dryer 16 shelf 36" x 36"; condenser
Devine Vac. Chamber Dryer 5 shelves 40" x 43"
Stokes No. 138 Vacuum Chamber Dryer 6 shelves; 23" x 34"
Stokes 16 Shelf Steam Heated Dryer; 3' x 3'; 6'10" overall
Koch Tray Type Electric Ovens; 58" x 69" x 72" with controls
Horizontal Dryers 66' x 14'7" long; with tracks; 2½" steam pipe with capstan closing doors each end

DRYERS—Atmospheric

Procter & Schwartz Continuous Apron Dryer; 12 sections; 5 panes with S/S woven mesh belt 7'4" wide; 36' overall
Procter & Schwartz Continuous Apron Dryer; 43'0" long, 7'6" wide, 14'9" high; apron width 36"; complete with accessories
Procter & Schwartz 12 section Dryer; overall dimensions are 13' wide, 76' long, conveyor belt in Type 316 S/S 8' wide
Adt Class G Rotary Dryer 2' x 15'; Indirect Gas heated
Squier Hexagonal Shell Stainless Atmospheric Dryer; 30" x 20'; stainless feed and aerofins
Louisville Counter Current Monel Lined Atmospheric Dryer; 28" x 16'
Louisville Rot. Steam Tube Dryers; 5' x 28'; 6' x 30'; 8' x 33'
Davenport Steam Tube Dryers: 5' x 24'
Hahn Direct Fired Rotary Dryer; 3' x 12' with accessories
Harsey Direct Fired Rot. Dryer; 3' x 24' with accessories

DRYERS—Rotary

Horizontal Jacketed Dryer or Cooler; 54" x 18' with agitator
Horizontal Steel Jacketed and Agitated Vacuum Cooker; 4' x 7'7½"
Rotary Vacuum Dryer 52" x 102" with agitator and accessories; 10 HP
Stokes Rotary Vacuum Dryer Model 59B; 40" x 15' long
Stokes Rotary Vacuum Dryer; 24" x 72"
Buffalo Rotary Vacuum Dryer; 5' x 30' with accessories

DRYERS—Drum

Buffalo Rotary Vacuum chrome plated Drum Dryer; 5' x 12' with accessories
Buffalo Rotary Vacuum Drum Dryer, bronze, 5' x 12' with accessories
Devine Vacuum Drum Dryer, bronze, 52" x 10'6"
Rotary Drum Dryer with steam heated nickel drum; 48" x 48"
Buflovak Double Drum Dryer; 32" x 72" with accessories
Bagley & Sewell Double Drum Dryer; 28" x 60"
American Double Drum Dryer; 24" x 80"
Buffalo Double Drum Dryer in Stainless; 32" x 120"
Buffalo Double Drum Dryers; 42" x 100" and 32" x 120"

EVAPORATORS

Goslin Birmingham Steel Sextuple Effect Evaporator complete with accessories; 58,200 sq. ft. heating surface
Swenson Quadruple effect Long Tube Evaporator; vertical film type with 5 vapor heads
Long Tube Double Effect Evaporator with copper tubes, 2000 sq. ft
Jos. Oates Copper Quadruple Effect Calandria Type: 2085 sq. ft.
Buffalo S/S Calandria Type; 90 sq. ft.; 3' x 11'5"
Zaremba Single Effect Cast Iron Evaporator with 130 sq. ft. copper tubes; 48" x 10'3" overall
Devine Single Effect Calandria Type Evaporator; 28" x 8'
Stainless Steel Jacketed Evaporator; 5'6" x 6' ASME Vacuum built with Calandria
Zahm & Nagel Continuous Evaporator or Concentrator; 2500 lbs. PH

FILTER PRESSES and FILTERS

Sperry 12" Stainless Steel Tube 41 Filter Press; 10 chamber; two eyed
Ertel Stainless Steel 12" diameter Filter Press; 5 chamber Plate and Frame; with pump
Hormann Bronze 12" Filter Press; 14 chamber recessed
Ertel Multiple 3 Way Filter with 7 square 12" chambers; and 7 Round disc 12" chambers complete with pump, etc.
A special lot of Filter Press Skeletons or Frames without plates in sizes 18", 24", 30" and 36" . . . several types
Shriver 18" Cast Iron 26" chamber recessed press; Open Del.
Sperry 18" Nickel Plated Bronze Filter Press; 16 chambers; 3 eyed; closed delivery
Shriver 24" Rubber Covered Cast Iron Press; 8 chamber
Albright Nell: 24" recessed 40 chamber Cast Iron Press
Shriver 30" Cast Iron 37 chamber recessed press; open del.
Shriver 30" Cast Iron 37 Chamber recessed press; open del.
Shriver 36" Rubber Covered Cast Iron; 34 chamber Press; 2 eyed; closed delivery; gear and pinion closing
Sperry 36" Cast Iron Type 41 Plate and Frame 34 Chamber Press; 2 eyed; speed delivery; ratchet gear closing
Shriver 36" Cast Iron 48 Chamber P.&F. Press; Open Del.
Sweetland Pressure Filter No. 2; 12 leaves on 3" centers
Sweetland Pressure Filter No. 7; 41 copper leaves; 2" centers
Sweetland No. 10 Filter; 19 Copper Leaves on 3" centers
Sweetland No. 12 Filter; 48 Copper Leaves on 3" centers
Sweetland No. 12 Filter; 36 Iron Leaves
Valley No. 40 Filter; 41 leaves; 4" centers; nickel contacts
Sparkler 33 D17 Horizontal Plate Filter; 91.8 sq. ft.
Sparkler Twin Unit Filter; plastic lined; (2) 50 gal. tanks
Sparkler Double Unit Steel contacts; 33/12
Bird Young Rotary Vacuum Filters; 4' x 4'; S/S screens
Eimco 8' x 8' Rotary Vac. Filter; with Nash Pump and complete accessories
Oliver Dorroe Type Rotary Vac. Filter; 6' x 3'; nickel contacts
Feine Rotary Vacuum Filter; string type 4'6" x 6' with Stainless Steel and Aluminum Contact Parts
Oliver continuous Rotary Vacuum Filter monel; 3' diameter with pump, receiver and accessories
Oliver Dorroe Rotary Vac. Filter; 4' x 1'
Oliver Rotary Vacuum Filter 11'6" x 12' complete with accessories
Le Val Stone Filter, acid Resistant; with pump and motor
Industrial Vertical Filter; 35" x 44" with 17 vert. screens

HAMMER MILLS, CRUSHERS, GRINDERS, PULVERIZERS

Jay Bee Type A Hammer Mill, 15" x 24" with 10 HP motor
Fitzpatrick Mill Model K with 15 HP AC motor
Raymond Imp Mill, 9" x 18", complete with accessories
Williams Model NF Hammer Mill, 25" x 14" requires 60 HP
Williams Hammer Mill, 36" x 18", requires 50-60 HP
Williams No. 4 Hammer Mill, 10" x 18", requires 65 HP
Gump Bar-Nun No. 40 Hammer Mill, 12" x 40", requires 60 HP
Gruendler Model X Pulverizer and Grinder
Jay Bee Shredder Type Hammer Mill with 100 HP
Williams No. 40 Pulverizer with 200 HP motor
Raymond Model No. "00" Pulverizer, motorized
Raymond Model No. "00" Auto. Pulverizer with acc.
Jeffreys Type E Swing Hammer Shredder, 42" x 36"
Mikro No. 4 F Pulverizer, 18" x 24", requires 40 HP
Mikro Model No. 4 with 75 HP motor
Williams Ring Roll Mill, ring 10" diameter by 3" face
American Ring Roll Crusher, 30" x 37" throat, 30 HP
Rietz RD18 Disintegrator, Stainless Steel, 30 HP
Rietz RD18 Disintegrator, Stainless Steel, 50 HP
Ball & Jewell Rotary Cutter, Model 1½, S.S., 40 HP
Stainless Steel Saw Tooth Crusher, 10" x 11" with 2 HP
Sprout Waldron Saw Tooth Crushers, 16" x 16" and 20" x 25"
Robinson Dbl. Runner Attrition Mill, 25", two 10 HP mtrs.
Sprout Waldron Double Runner Attrition Mill, 30", 2 - 30 HP
Bauer Double Runner Attrition Mill, 36" two 50 HP
Fitzpatrick Model "D" Comminutors—with 3 HP motor

REACTORS

S/S Reactor; 24" x 48"; oil heated; agitated
S/S Jacketed Reactor; 24" x 40" with agitator
S/S 500 Gal. Jacketed Reactor; 6' x 30"
S/S 250 Gal. Closed Top; 36" x 50" agitated
Monel Jacketed and Agitated 250 Gal. Reactor with S/S Condenser, Receiver, etc.
S/S 675 Gal. 4' x 5' Jacketed and Agitated
S/S Despiay Jacketed Reactor; 40" x 8'
Dopp Cast Iron 650 Gal. Full Jacketed Agitated Reactor; 60" x 62"
NEW Buflovak 500 Gal. Steel Jacketed and Agitated Mixing Kettle; 4' x 5'2"
S/S 600 Gal. Reactor with Reflux Condenser; 5 HP agitator
Pfaudler Jacketed and Agitated Glass Lined Reactor; 47" x 62"
Steel 400 Gal. Vacuum Receiver; 3' x 7'
Cast Iron 1000 Gal. Nitre Pot; 6' x 6'; agitated; 5 HP
Stainless Reactor; 2800 Gal. 7'6" dia.; 125 PSI internal
Steel Reactor 3000 Gal.; 10'8" x 4'10"; Jacketed; Agitated
Steel Reactor 3300 gal.; 6' x 16'6"; Jacketed; ASME complete with condenser, pump and accessories
Copper Steam Jacketed Vacuum Reactor; 650 Gal; 54" x 7'
Steel Still 54" x 96" with steel receiver 54" x 96"

STILLS and COLUMNS

Stainless Steel Jacketed Evaporator; 3'6" x 6' ASME; Vacuum Built with calandria
Harris Stainless Steel Vacuum Pan with Stainless coils 6' x 30'6" overall; with condenser, Vac. Pump, etc.
Nickel Clad Evaporator; 6'6" x 18"
Copper Steam Jacketed Vacuum Pan; 38½" x 42"
Aluminum Steam Jacketed Vacuum Pan; 40" x 60"
Steel Still, 54" x 96" with receiver
Stainless Steel Bubble Cap Column 16 section; 8½" x 19'
Monel Converter 2000 Gal. 5'9" x 12'
Fractionating Columnar Tower; 24" x 51'; packed rasehig rings
HCL Absorber; 15" x 16'6½"
Stainless Steel Hi Pressure Scrubber; 12" x 4'
Monel Water Distillation Apparatus; compression type; 22" x 67"

TABLET PRESSES

F. J. Stokes Rotary Cube Press RD6 with motor
Stokes Rotary DD Tablet Press; 23 P. & D. 1-7/16" x 1⅛"
Stokes Rotary D1 16 Punch Press; ⅝ 11/16"
Stokes Rotary D 4 16 Punch Press; 15/16" x 1-9/16"
Stokes Rotary D 3 16 Punch Press; ⅝"
Colton Rotary 9-18 Press; 2" x 2-3/16"
Colton Rotary 19-35 Press; ⅝" x 1⅝"
Kux Rotary 16 Station Model I AB; 5 HP motor
Colton Single Punch Press; Model 9 AT; 2" x 5"
Stokes R Single Punch Tablet Press; 2½" x 2"
Kux 75 Ton Model 65P Toggle Type; 3" x 3"12" 2½ HP
Kux 20 Ton Model No. 52 Toggle Type; 2" x 1½

FIRST MACHINERY CORP.

157 HUDSON ST. WOrth 4-5900 NEW YORK 13, N. Y.

HATS OFF TO CHEMICAL ENGINEERING

for 50 YEARS OF A THOROUGH JOB OF JOURNALISM

AND TO LAWLER *For 50 Years*

of THOROUGH REBUILDING AND SALES
of PROCESSING and PULVERIZING EQUIPMENT

Hammer Mill GA30 Williams with 100 hp motor
Rotary Kiln 6' x 80" w/mtr.
Mills, Hardinge 7' x 36", 8' x 22"
Vacuum Pump, Devine, 10" x 10"
Lime Hydrator, Clyde, #2 continuous
Jaw Crusher, 8" x 11", 8" x 14", 11" x 20"
Roll Crusher, 12" x 12" (New) 16" x 10"
Exhausters, 40 in stock to 80 AA CFM
Dry Pans, 7' dia., 9' dia., 10' dia.
Centrifugals, 48", rubber lined. 42" lead lined, 26 tinned copper.
BUILDING steel, 85' x 165'
Overhead crane, 10 ton, 43' spon. A.C.

— also available —

Crushers, Saw—Gyratory, Roll
Mills—Pebble, Ball, Pug
Pulverizers
Presses—Tile, sagger, screw
Filters—Press, drum
Agitators
Tanks
Compressors—piston, turbo
Blowers
Dryers
Kilns
Mixers
Screens
Boilers
Furnaces
Conveyors
Bucket Elevators
Fork Lifts

FAMOUS around the WORLD FOR **VALUE** AND **DELIVERY** *FOR 50 YEARS*

LAWLER COMPANY Metuchen 6-0245 Metuchen, N. J.

ME

SPECIALS FOR JULY

Buffalo 42" x 198" Double Drum Dryer.
Sharples Py-14 Super-D-Canter, S.S.
Sweetland No. 12 Filter, 36 hrs. on 4" cent.
Sweetland No. 5 Filter, 30 hrs. on 2" cent.
Sharples ACVO S.S. Centrifuge. Motorized.
Enterprise 7' x 60' 6Steam Tube Dryer.
Rotex Model 52 screen, 2 Deck 60" x 120".
Elmco 8' x 8' Rotary Vac. Filter. Complete.
Oliver 5'3" x 10' Rotary Vac. Filter.
AT&M 40" basket. Solid Steel. 25 H.P.
Copper Still, 48" x 50' column. Complete.
Sperry 36" Filter. 60 P & F. Hyd. cls.
Shriver 30" Filter. 29 plts—30 frms.
Sperry 18" Bronze Filter. 25 rec. plts.
Multiclone Dust Collector. Model 25-S.
Condensers. 1900-2300 sq. ft. Steel. (8).
8' x 16' Coil Evaporator. Stainless.
Resina Single Head Capper. 28 mm.
600# S.S. Ribbon Mixer. 5 HP.
7½' x 60' Rotary Dryer. ½" shell.
Oliver 4' x 6' Cast Iron Rotary Vac. Filter.
Anderson Super Duo Expellors. Complete (2).
Fitzpatrick Model D Mill. S.S. 7½ HP.
Abbe Tube Mill. 42" x 16'. Porc. Lined.
2000# Paulsen Double Ribbon Mixer. 15 HP.
Lead Lined Pressure Tanks, 150 Gal. (3).
Stokes Model BB-2 Rotary Tablet Press.
4' x 24' Rotary Dryer. Complete.

Partial List only—We Buy Your Surplus

MACHINERY AND EQUIPMENT CO.
618 BRYANT STREET SAN FRANCISCO 7 CALIF

WE HAVE IN STOCK FOR IMMEDIATE DELIVERY THE FOLLOWING TYPES OF EQUIPMENT

Agitators
Autoclaves
Boilers
Air & Refrigeration Compressors
Colloid Mills
Double Drum Dryers
Dehumidifiers
Evaporators
Extractors
Expellers
Fillers
Filters
Filter Presses
Flake Rolls
Heat Exchangers
Material Handling
Stainless-Steel Jacketed Kettles
Mixers-Ribbon & Sigma Blades
Motors
Pulverizers
Pumps
Scales
Sifters
Stainless-Steel Tanks
Large & Small Steel Tanks
Three Roll Mills

Consult Us For Your Chemical Processing Equipment

SEND US YOUR INQUIRIES WE BUY ONE ITEM OR ENTIRE PLANTS

AARON Equipment Company
1347 So. Ashland Ave., Chicago 8, Illinois
PHONE: CHesapeake 3-5300

FOR SALE

NEW FILTER PRESSES

3—Valley Model 330, 30" x 30", Valley Code 295. Bronze Alloy, Plate and Frame Filter Presses. Washing Type. Closed Feed and Discharge. In Original Cartns.

CENTRIFUGES

2—Sharples, Model AS-18V. Oil Purifier, 3 Phase Motor Drive.
1—Sharples, Model #12, Vaportite, 3 Phase Motor Drive.

PUMPS

2—Stokes Microvac. Model 212E. 3 Phase Motor Drive. New, 1947.
1—Gould Centrifugal—4" Intake, 3" Discharge. 20 HP BB 3 Phase Motor Drive.
1—Fredrick Centrifugal, 8" Intake, 6" Discharge, 10 HP BB 3 Phase Motor Drive.
1—Willey Centrifugal, 2½" Intake, 2" Discharge, 5 HP BB 3 Phase Motor Drive.
1—Gould Centrifugal, 4". 7½ HP BB 3 Phase MD.
1—Vickers Hydraulic Power Unit, Model #13-FB-1224 with Vickers #V-134 Pump. 10 HP 3 Phase MD.
1—Vickers Hydraulic Power Unit, Model #13-HB-1228 with Vickers #V-135 Pump. 10 HP 3 Phase MD.

BLOWER

1—American #5 High Pressure Gas Furnace Blower. 5 HP 3 Phase Motor.

METAL TURNINGS CRUSHER

1—Jeffrey Model MT-26. 125 HP 3 Phase Motor Drive, Crusher New 1945. Motor New 1948.

Continental Machinery & Equip. Co.
Ostend & Ridgely Sts. Balt. 30, Md.

Chem and Pro Salutes 50 Years of Chemical Engineering Progress and offers an extensive

CHEMICAL & PROCESS MACHINERY CORP.
Pledged to Personal Service

inventory of modern equipment to meet your needs for Chemical Production

A FEW ITEMS FROM OUR OUTSTANDING STOCK

1—Pfaudler 300 gallon glass lined jacketed and agitated reactor
1—Pfaudler 400 gallon glass lined jacketed and agitated reactor
1—Stokes 500 gallon stainless steel reactor or vac pan, coiled and jktd
9—100 gallon ½" thick stainless steel type 347 autoclaves, with TA27 Nettco drives
1—Sharples Super-D-Canter type BM 323-A3B with 15 HP XP motor, stainless steel type 316
1—210 ton Worthington refrigeration unit, complete
1—Bird 36" x 50" stainless steel continuous centrifugal
5—Beaird Challenger horizontal rotary dryers, 4' x 27' with 7½ HP motors, gas or oil fired
1—Louisville 4'6" x 25' rotary tubular dryer, 4" tubes
2—Raymond #1 pulverizers, one complete with 40 HP turbine
5—2500 gallon steel agitated vacuum reactors, coiled
7—4000 gallon autoclaves, jacketed, ASME coded, steel
2—7500# dry powder mixers, 6' x 7' x 9'
1—Gehnrich electrically heated truck dryer, 6' x 6' x 7'
1—Hardinge 4' x 14'6" tube mill, granite brick lined
1—6" x 6" laboratory stainless steel double drum vacuum dryer, complete
1—Unused Mikro #2 pulverizer, steel constructed
1—New Dorr rake classifier, rubber lined, with motor 3'5" x 6'4" x 39'10"
1—75 sq. ft. stainless steel type 304 condenser, good for vacuum
1—Pfaudler 14 sq. ft. glass lined thimble condenser
1—Pfaudler 150 gallon glass lined evaporating dish
1—Burkhardt 40" heresite perforated basket centrifuge, lead curb
1—Devine double effect evaporator, steel constructed, 2'5" x 10' & 3' x 15'
1—Day 1300 # Size E dry powder mixer
5—Rotex sifters, 28" x 48" up to 40" x 10"
1—Klein 100 sq. ft. stainless steel filter, complete
1—Eimco 4' x 1' steel unused filter, complete
1—Stokes #37 rotary tablet press, 19 stations, 3" x 4" tablets, 250 PM
1—Ball & Jewell #1 shredder or rotary cutter
1—Szegvari attriter, type B, 60 gallons—5 HP—stainless steel
2—Allis Chalmers 9" x 36" double roller grinders
12—Stainless steel tanks, 25 gallons up to 1200 gallons, cylindrical and rectangular

• MONEY-BACK GUARANTEE • MONEY-BACK GUARANTEE •

MONEY-BACK GUARANTEE

YOU MAY PURCHASE THIS EQUIPMENT UNDER OUR "YOURS FOR THE ASKING POLICY." UNDER THIS ARRANGEMENT, YOU WOULD SEND US YOUR ORDER AND CHECK IN FULL, WE WOULD SHIP THE MACHINE SUBJECT TO YOUR INSPECTION FOR A PERIOD OF FIVE DAYS, AND IF AT THE END OF THAT TIME YOU ARE NOT ENTIRELY SATISFIED, YOU MAY RETURN IT FREIGHT PREPAID TO OUR WAREHOUSE, 52—9th STREET, BROOKLYN IN THE SAME CONDITION AS WHEN SHIPPED TO YOU, FOR FULL AND COMPLETE REFUND.

Chemical & Process Machinery Corp.

MONEY-BACK GUARANTEE

• MONEY-BACK GUARANTEE • MONEY-BACK GUARANTEE •

14—Disc filters: Alsop, Ertel, Hormann; bronze; aluminum, and steel, 12" to 16". 2 to 10 discs
70—PUMPS, centrifugal, rotary, diaphragm; lastiglass, iron, bronze, monel, s/s rubber, up to 6" x 4", up to 400 GPM
12—Vacuum pumps, Devine, Beach Russ, Nash; up to 200 CFM
11—Mixers, dough, single and double arm, up to 3 bbls
8—Dry powder mixer, 50 to 1300#, Day & Robinson
30—Labelers, World, Ermold, National, Nu-Way, Moore, semi-automatic and automatic
40—Fillers, all types, Kiefer, US, Urie, Colton, Stokes, Ertel, American Bond Scale, etc. Liquids, pastes or powders
20—Tablet Presses, single head, and rotary; Stokes & Colton, up to 3" x 4"

6—Roller Mills, 12 x 32 & 16 x 40, 3 & 5 roll watercooled
1—Jones agitator drive 5 HP 59 to 1 ratio
2—Foote Bros. 5 HP agitator drives, 108 to 1 ratio
1—Nettco MD 7½ HP agitator lead shaft and props, 70 RPM
2—Falk agitator drive 7½ HP 125 RPM
2—Lightnin Model D3 XP 1 HP agitator DC s/s props
4—Lightnin Model 3375 triped ring ¾ HP agitators 1750 RPM
12—¼ HP portable agitators, 1725 RPM, Lightnin, Chemical & Process, single and 3 Phase, some new, some XP.
3—200 gallon impregnators or autoclaves, Vulcan, jacketed, ASME coded
2—Sutorbilt 12" blowers positive displacement, 2400 CFM, 12" x 10"
1—Devine steel surface condenser, 35 sq. ft. with receiver
1—Unused lead lined condenser, 16" x 6'—66 sq. ft.
1—Stokes 4' x 6' single drum dryer or flaker, atmospheric
2—Stainless steel heated rolls, 30" x 30" x 1"
1—Gehnrich electrically heated truck dryer, 6' x 6' x 7'
1—Jeffrey screw type continuous dryer, 3 high 24" x 15'
1—Sparkler Model 14C-S stainless steel filter
1—Whiz Packer, rotary, 4 pockets
1—Stokes 79D closer & crimper 12 cup with ejector
1—100 gal UNUSED lead lined jacketed REACTOR

SEND FOR BULLETIN 652

CHEMICAL & PROCESS MACHINERY CORP.

146 GRAND STREET
NEW YORK 13, N. Y.
Telephone: WOrth 4-8130

FACTORY: 52 NINTH St.
BROOKLYN 15, N. Y.
Cable Address: "KEMPROCESS"

QUICK DELIVERY ON GUARANTEED EQUIPMENT

Large Stock at our Brooklyn Warehouse & Shop

DRYERS & KILNS

Devine #12 Vac. Shelf Dryer, 40"x42" shelves.
Lyden size, single truck Dryer 600° F.
2—Ruggles Coles 7½' x 60' & 6' x 45' Rotary Dryers.
1—Allis-Chalmers 10' x 90' Rotary Kiln.
1—Ruggles Coles 54" x 25' Rotary Dryer.
New Rotary Dryers, Kilns & Coolers built to order.
2—Proctor 6 fan automatic Conveyor Dryers.
2—Albright-Nell 4' x 9' Atmos. Drum Dryers.
1—Buffalo Vac Drum Dryer 24' x 28'. Also Rotary Vac. Dryers & Vac. Shelf Dryers.
6—Steam, Gas & Electric Dryers, Tray & Truck.

CENTRIFUGALS & CENTRIFUGES

5—Tolhurst 40" Suspended Type Centrifugals. Bottom Discharge. Motor Driven.
6—Centrifugals 20", 30", 40" & 48", Steel, Copper, Stainless & Rubber Lined.
12—Sharples Centrifuges #3A Stainless. Also #6.
3—De Laval Multiple Clarifiers #20C, 300 & 301.

FILTERS

1—Vallez 41 Stainless Covered Leaf Filter, type 40.
10—Sperry & Shriver 12", 18", 24", 30", 36", Iron Filter Presses. Also 12" Bronze.
Sweetland & Oliver Rotary Vac. Filters.

KETTLES & TANKS

1—Doop 350 gal Cl Agit. Vac Kettle.
Devine 36" dia. Improg. Unit, closed jack-Liquor & Improg. Kettles. Also 100 gal. size.
1—Steel ASME 275 P61 Pressure Tank. 1280 gals.
Devine 1000 gal. closed jack agit. steel kettle.
1—2300 gal. vert. agit. jack Steel Kettle.
8—Jacketed Kettles 50 to 2500 gals.
1—250 gal. Lead Lined Kettle.
1—1000 gal. Stainless Agitated Tank.
6—Pfaudler 1000 & 500 gal. vert. Glass Lined Tanks.
4—10,000 & 5,000 gal. horiz. Steel Tanks.
New Stainless Steel Tanks 50 to 3000 gals.
30—Stainless Alum., Copper, Glass & Lead Lined Kettles & Tanks. Also new Stainless.
6—Copper Varnish Kettles 150, 200 & 300 gals.

PULVERIZERS & MILLS

#1 Raymond Automatic Pulverizer 20 H.P. motor.
1—Raymond #00 Pulverizer 30 HP. Complete.
4—#0000 Raymond Mills.
8—Hammer Mills & Pulverizers 3 to 50 H.P.
1—Schutz-O'Neill 20" Pulverizer. Also #1.

1—Sturtevant 30" Rock Emery Mill.
1—Robinson 22" Attrition Mill.
1—Lehman 4 Roll W. C. 12" x 30" Steel Mill.
5—Lehman & Kent 3 Roll Steel Mills.
8"x22", 9"x22", 12"x30", 6"x40".
1—9" x 36" Double Steel Roller Mill.
1—9" x 24" 3 pr. high steel Roller Mills.
3—Hoschin 18" x 36" 4 Roll Granite Stone Mills.
Abbe 8' x 8' Pebble Mill & other sizes.
8—Abbe Jar Mills Lab to 25 gal. sizes.
Ball & Jewell & Leominster Rotary Cutters.
1—U. S. Colloid Mill 1½ HP Motor.

MIXERS—ALL TYPES

Baker-Perkins heavy duty double arm Mixers, 100, 50 & 5 gals. motor driven.
Horiz Mixers single & double arm to 200 gal.
Day & Ross 40 & 15 gal. Pony Mixers.
1—Century 2 HP, 4 speed Vert. Mixer.
6—Lead & Paste Mixers 50 to 150 gals.
Patterson 3½' dia. Stainless Conical Blender.
1—Master Drum Type Blender 1000 S.
Lancaster #3 Pan Mixer 7½ HP. M.D.
10—Dry Spiral Mixers 50 to 2000 lbs.
12—Portable Elec. Liquid Mixers ¼ to 3 HP.

MISC. & SPECIALS

4—French Oil Linseed & Cottonseed Hydr. Presses.
Gould 75 HP. Centr. Pump, 250 PSI.
4—French Oil Motor Driven Expellers.
New 6" x 12" Lab Mixing Mills & Calenders.
4—Farrel 15" x 36", 10" x 48" & up to 22" x 60" 2 Roll Mixing Mills.
2—Rubber & Plastic Extruders 1' to 8".
1—Stokes 2E Paste Filler up to 5 gal.
1—Marco 2200 Stainless Steel Homogenizer.
1—Stokes & Smith & Day Powder Fillers.
6—Filling Machines. Liquid, Paste & Powder.
Rotary & Single Punch Tablet Machines, ½" to 3".
2—Howe Mogul Barrel Bag Packers.
2—Revolving Pans 36" & 30".
4—Stokes Vert. High Vac. Pumps.
2—Worthington 12" x 12" x 12" Vac. Pumps.
6—Devine & Buffalo Vac. Pumps.
Soap Machinery for Toilet Laundry Chip Liquid.
Hydr. Presses, Pumps & Accumulators for Rubber & Plastics, Injection Molding Machines.
Boilers. Gas, Oil & Coal Fired. Roller conveyor.

WE BUY YOUR SURPLUS MACHINERY & COMPLETE PLANTS
PARTIAL LISTING. WRITE FOR BULLETINS. PHONE: WORTH 2-5745

STEIN EQUIPMENT COMPANY

90 West Street, New York 6, N. Y. Cable Machequip

RE-NU-BILT
GUARANTEED
ELECTRIC POWER EQUIPMENT

TURBO GENERATORS

Qu	Kw	Make	Desc.
1	6000	A.C.	Condensing 200/250 # I.S.P. 2300/3/60—Exc. & Surf. Cond.
1	750	GE	Condensing 425 # I.S.P.—750° TT 440/3/60—Exc.

MOTOR GENERATORS SETS

3 ph. 60 cy.

Qu	KW	Make	Speed	Volts	Volts
1	2000	GE	514	600	4000/13800
3	1500	GE	514	250	6600/13200
1	1500	GE	720	600	6600/13200
1	1500	GE	600	600	2300/4150
1	1500	GE	360	275	2300/4600
2	1000	Whse.	900	600	2300/4150
1	1000	GE	900	260	4000/6600
1	750	Whse.	900	275	2300/4150
1	500	Whse.	1200	125/250	2300
1	500	Whse.	900	250	6600/13200
1	500	Whse.	900	250	440
1	400	Whse.	1200	250	2300

Transformers—60 cycles

Qu	Kva	Make	Type	Ph.	Voltages
3	1250	GE	HVDDJ	1	6600x550
1	1150	A.C.	OISC	3	13200x480/2400
3	1000	GE	HVDDJ	1	2200x480
3	150	GE	OISC	1	33000x2300
3	150	GE	OISC	1	34500x230/460
1	50	Mol.	OISC	3	13200x120/208

D.C. Motors

Qu	HP	Make	Type	Volts	Speed
1	500	Whse.	CC-216	600	300/900
1	400	GE	MCF	550	300/1050
1	300	GE	MFC	230	360/920
10	150	C.W.	TEFC	230	890

The above are only partial Stock listings

Send Us Your Inquiry.

BELYEA COMPANY, INC.

32 Howell Street, Jersey City 6, N. J.

NEW AND GOOD-AS-NEW EQUIPMENT

Stainless Steel Tanks, new, 100 and 200 gal.
2—300 gal. #312 Stainless Tanks—new.
1—Stainless Tank No. 430 Chrome, vert. 7' dia. 10' deep, dished bottom, ¾ plate.
20—Steam Jacketed Kettles, Stainless Steel, Copper & Aluminum, 5 to 250 gals.
1—Copper Evaporator, steam jacketed, 9'1" x 3'9".
60—New Pressure Cookers, 18"x18" & 24"x28".
30—Pumps—steam and electric.
1—New Glass Lined Centrifugal Pump, 100 gpm.
1—Jeffrey Vibrating Conveyor 15' lg. 12" wide.
1—Buflovak Jacketed Impregnating Tank 42"x52".
1—4 x 8 Sturtevant Jaw Crusher.

SPECIAL: 1—J. H. Day Steam Jacketed, 50 gal. Sigma Blade Mixer.
5—Horizontal Steel Tanks 12' x 27'—15,847 gals. each.
1—Abbe Pebble & Tube Mill, 5' x 22'—Burr-Stone Lined.

1—Ribbon type Mixer, steam jacketed.
1—Model 16 Sharples Stainless Steel Centrifuge.
1—New Drum Rollers.
1—A.F. Bartlett Hog Mill & 7-½ H.P. Motor.
1—Sweetland Filter No. 5—15 leaves.
2—Stainless Steel Jacketed Filters.
2—Plate & Frame Filters 25"—open del.
4—Tanks 100,000 gals. each.
1—Shriver 18" Aluminum Filter 9-plates 9-frames, closed delivery.
4—Stokes Rotary Tablet Machines RD4.
10—New Sharples Oil Purifiers.
6—New Cleven Can Filling Machines.

H. LOEB & SON :-: 4643 LANCASTER AVE. PHILADELPHIA 31, PA.

FOR SALE

Plating and Anodizing Equipment

7—PANELS, Three 3000 A. 250 V DC ITE, Type KT917, disconnect switches per panel.
6—Rubber lined steel Pans (Goodrich sulphur free rubber) 7'3½" x 4'7-½" v 8" deep.
85—Hard Rubber Anode Boxes 20-¾" x 13-7/8" x 8" deep.
1—9" Cash Standard type 33P Pilot operation back pressure control Valve.

(ALL OF THE ABOVE NEVER USED)

BENSON-WILIMZIG, INC.

"Large Buyers of Electrical Equipment"

1708 North 8th St. St. Louis 6, Mo.

STORAGE TANKS

—Prompt Shipment—

GLASS LINED TANKS — USED—3000 gallon capacity. Welded construction—Fully insulated. Equipped with manhead. Suitable for milk, food products, lily white chemicals, solvents and fine lacquers.

VARNISH TANKS—USED—54" diameter x 14'6" high (or long) ¼" Steel — Welded construction — 1700 gallons.

MISCELLANEOUS TANKS—Various sizes and types.

ERMAN-HOWELL DIVISION

LURIA STEEL & TRADING CORP.

332 South Michigan Ave.
Chicago 4, Ill.
Telephone: Wabash 2-0250

ROTARY DRYERS

2—70" x 35' Ruggles Coles A-10.
Single Shell: 4x20, 4x45, 5x30, 6x35, 5½x7x80.

MISCELLANEOUS EQUIPMENT

Hammermills: Jeffrey 36 x 24 B & 42 x 36 Flextooth-Williams 69 GA.
Dings 60"—3 Roll Type I.R. Magnetic Separator.
8', 10' & 16' Mechanical Air Separators.
8 x 6, 6 x 6, 6 x 10 & 7 x 6 Ball Mills.
20 & 21 Raymond Automatic Pulverizer.
4x45, 4x30, 5½x7x80 & 5x60 Rotary Kilns.
2—5' x 22' Silex Lined Tube Mills.
Wetherell 8 Pole Mag. Sep. 18" Belt.
10' x 36" Hardinge Air Classifying Ball Mill.
2—5 x 18 Tube Mills.
Heavy Media Separation Unit.
Hercules Junior 3 Roll Pulverizer.
Clyde-Kuntz Continuous Hydrator.
7 Elec. Air Compressors, 1300, 3100 & 3374 Ft.
135—8000 & 10,000 Gal. Tank Cars.
45 Ton Plymouth Diesel Locomotive.
450 ft. Chgo Pneu. Elec. Compressor.

STANHOPE, 60 E. 42nd St., N. Y. 17, N. Y.

TRADE WITH BAUER
BUY - SELL - TRADE
your
COMPRESSOR VACUUM PUMP STEAM BOOSTER
L.W.BAUER

VALVES

Saunders Diaphragm. Stainless. 1½". Style 800. NEW 30% off
Nordstrom Plug. 8" No. 24190. NEW 50% off
Lapp "Y" Porcelain. ½" Cat. # C26171. NEW 40% off
Many other valves. New & Good used.

PUMPS

Byron-Jackson "PUP" Pump. Heavy Duty. With 8 cylinder Chrysler engine. New War Surplus. Guaranteed ..... $1585.
Roots-Connersville Pos. Pressure Blower Pumps Size 42 with 2 HP 220/440 V. Motor. NEW. 20% off.
TANKS: 3,000 Gal glass lined. Pfaudler #3334 or Equivalent. Used.
Engine Driven GENERATOR SETS. Reconditioned & Guaranteed. Up to 2,500 KW. Let us know your emergency power requirements.

HARBER INDUSTRIALS

3520 W. Ogden Ave. Chicago 23, Illinois

All offerings are subject to prior sale and are FOB Chicago

FOR SALE

BOILER

200 lb. 15 H.P. Eclipse gas fired. Fully automatic. In operation.

FS-4633, Chemical Engineering
330 W. 42 St., New York 36, N. Y.

IT'S A BIG EVENT . . . WE'RE PROUD TO HAVE BEEN IN THE BOOK FOR SO MANY YEARS

ORCHIDS
TO
CHEMICAL ENGINEERING
on the completion of its
50th YEAR
OF LEADERSHIP IN TECHNICAL JOURNALISM

HERE'S ANOTHER "H&P" BIG EVENT ACT NOW — FIRST CLASS EQUIPMENT

1106-36 Link-Belt Rote Louvre Dryer, Complete Installation, including furnace, dust collectors, fans, breeching, stacks, instrument control panel. Installed 1947, operated very little — like new. Priced right for shipment before removal from plant.

Also, one (1) 1106-36 Dryer, as above, (Dryer and fans only.) New 1942.

OTHER EQUIPMENT
in STOCK at the "H & P" Warehouse

AUTOCLAVES
2,000 gal. agit. jacketed 200 PSI (3).
75 gal., steel, agit., 150 PSI.

BLENDERS
730 cu. ft., steel.
310 cu. ft., jacketed.
157 cu. ft., Sturt. BA, steel (2 NEW).
2.7 cu. ft., copper (3).

BLOWERS
(WRITE FOR COMPLETE LISTING)

CENTRIFUGES
40" perforated, steel, Tolhurst.
40" perforated, SS, Fletcher.
24" Bird, CH, SS, series 200.

COLUMNS-TOWERS
8'x36'x¾" Absorption (2 UNUSED).
5'x47'x¾" Absorption, ASME 20 Trays (2).
5'x38'x¾" Absorption ASME, 14 Trays.
3'6"x58'x⅝" Absorption.
6'x44'x1¼" Scrubber, 5" heads, 225 PSI.
24"x13' C.I. Fractionating 18 plate.
6'x49'x¾" Bubble Cap, 19 Trays.
6'x29'8" Bubble Cap, SS, 21 trays.

CONVEYORS
Belt—All widths and lengths.
Screw—12"x60'.
Apron—36"x34'.
(WRITE FOR COMPLETE LISTING)

CRUSHERS, MILLS, PULVERIZERS
14"x16" Bartlett & Snow, 2 roll (Unused).
24"x24" Bartlett & Snow, single roll.
#1 Raymond, w/feed conveyor & cyclone.
24"x18" Jeffrey A2.
40"x14" Two-roll Traylor.
18"x36" Jaw, Traylor, Bulldog.
48" Symons, vert., disc.
24"x24" single roll, Fairfield.
4-roll Raymond.
5'x22' Smidth, Tube.
6'x8' Patterson, Ball.
6'x8' Abbe, style GPH, Ball.
36" Stedman, four cage.
Size B, Abbe.
16"x40", three roll.
Size 1, Allis Chalmers.
No. 3 Williams.
GP-106 Williams.
K-200 Kombinator, SS.

DIGESTERS
3900 gal., agitated, jacketed, ASME (7).

DRYERS
Spray, 5'x30'x¾" w/raschig rings.
Turbulaire N2 Spray, SS, complete.
Stokes, Rotary, Vac. 30"x8' complete.
Stokes, 4'x9', Atmos. double drum.
Buflovak, 5'x6' Atmos, single drum.
Tunnel Truck, 9'x35'x9' cap. 14 trucks.
Proctor & Schwartz 6'x40' Conveyor.
Proctor & Schwartz 24"x28'9" Conveyor.
Proctor & Schwartz 8'x94' SS Conveyor.

FILTERS
18" Press, ratchet, closed del. 11 chambers.
36" Shriver, 35 chambers, center feed, open.
8'x12' Feinc, all steel.
8'x10' Oliver, wood and steel (3).
11'6"x18" Oliver, all steel.
4'x5' Oliver, SS and wood (2).
#7 Sweetland, 2" spacing 28 leaves.
12" Sperry, aluminum chambers.

HEAT EXCHANGERS
Allis Chalmers 400 sq. ft. Adm. tubes (NEW).
Wheeler, 3,640 sq. ft. Adm. tubes (NEW).
Braun, 1,035 sq. ft. 4 pass, 250 PSI (2).
Whitlock, 3,463 sq. ft. vert. (4).

KETTLES
5500 gal. aluminum 8'x15'x⅜" agit. (2).
2350 gal. ASME, jackt'd. agit. steel.
1500 gal. jackt'd. C.I.
400 and 500 gal. glass-lined, jackt'd. agit.
40 gal. SS clad, 40 PSI, jackt'd. (4).

KILNS—COOLERS—DRYERS
10'x90'x9/16" Allis Chalmers.
7'x60'x⅜" with lifters.
5'x67'x5/16" with lifters.
5'6"x25' complete.
7'x125'x¾" Vulcan.
4'x35'x½".
4'6"x40'x¾".

MIXERS
Paddle, 19"x24"x18' complete w/drive.
Paddle, double shaft, 140 cu. ft. (NEW).
Readco 11½ SA, 88 gals.
Blystone 48"x6'7", 500 gals. (2).
Ajax #3, Super, 173 gals.
Dayton, 100 gals., vert., steel agit.
Champion type E, size 2, 110 gals.
Robinson, two-high, continuous.

PROPANE PLANT
3000 CFH Vaporizer-Mixers, complete (3).

PUMPS & REDUCERS
(WRITE FOR COMPLETE LISTING)

TANKS & PRESSURE VESSELS
135,000 gal. 30'x26' w/coils.
25,000 gal. 10'x40'x⅜" (NEW).
12,000 gal. 8'x32'x½" (NEW).
8,500 gal. vert. 8'x23'x5/16" (NEW).
4,100 gal. vert. 5'x28'x¼" (NEW).
3,400 gal. 7'6"x10'x¾" type 430 SS.
1,250 gal. 4'x14', 106 PSI.
1,200 gal. 42"x16'8"x3/16", 125 PSI.
1,050 gal. 4'x12'x½", 106 PSI.
6,500 gal. TANK CAR TANKS.

VAPORIZERS, SUBLIMATION
4'x10', jackt'd., agit. (2).

WEIGHTOMETER
20 ton, 18"x8'6".

ABOVE IS ONLY PARTIAL LISTING OF OUR INVENTORY
Write for our catalogue

Heat and Power Co., Inc.
70 PINE STREET | HAnover 2-4890 | NEW YORK 5, N. Y.
MACHINERY & EQUIPMENT MERCHANTS

CLASSIFIERS: 4—Akins and Wemco 54" and 78", single screw, double pitch, weir type, 220/440 volt motors, all in new condition. Three of the above located near Reno, Nev. 2—Dorr 8' x 30' rake, one with 18' and one with 22' bowl. New condition.

DRYERS or KILNS: 2—10 ft. x 90 ft., heavy duty, with or without auxiliary equipment, condition like NEW. One located in Minnesota. 1—Kiln 4 ft. dia. x 65 ft., complete with all equipment, oil fired, like NEW. 2—Kilns 7'6" x 125 with Fuller Lehigh grate type coolers 3'6" x 16' with or without all auxiliary equipment.

FILTERS: 2—Oliver acid resistant, 14 x 18' drum Filters with steel tank, with all auxiliary equipment, including compressor, vacuum pump, motors, speed reducers, etc. Condition like new. One located on west coast.

AIR SEPARATORS: One Bradley and one Sturtevant 16 ft., with or without 100 H.P., 440 volt, motor.

PULVERIZERS: Hardinge Mill size 5 ft. x 22", steel lined, complete with disc feeder and 30 H.P. motor. 1—5' x 36", silica lined. 1—Sturtevant 1-½ Ring Roll Mill. 1—3' x 4' Eimco Ball Mill complete with liners, ball charge, V-belt drive and 20 H.P. motor and control, NEW condition. One Marcy Rod Mill 8' x 12' and one 5' x 14', manganese lined, with motors and drive.

TRUCK CRANE: Northwest, 40' boom, 1 yd. clamshell, mounted on Mack 6 cyl. chassis.

REDUCTION CRUSHER: Symons 5-½ ft. Cone, short head, fine bowl, V-belt, 200 H.P. motor and control.

COMPRESSORS: Worthington DC2, 29/18-½ x 21, 600 H.P. synchronous motor, 440 volt, with all auxiliary equipment. 4—Ingersoll Rand Diesel portable, 500 cu. ft. @ 100 lbs. pressure. NEW 1951.

MONORAIL CRANE: 3 tons capacity, 80 ft. runway, 1 yd. Hayward motor driven clam shell, 220 volts, D.C.

STEEL BUILDING: 382 ft. long, 36 ft. wide, 13'9" inside, corrugated aluminum sides and roof.

BOOT BUCKET ELEVATORS: 2—Fully enclosed Chain Bucket Elevators 24" x 48" x 40' centers, buckets 8" x 12" x 7" deep, links 2-1/2" x 4", bucket to bucket center 16" with 10 H.P. motors and speed reducers, 220/440 volt, A.C.

SCREW CONVEYORS: 1—18" x 10' and 1—16" x 12', complete with motors, reducers, etc.

ELECTRIC HOIST: Single drum, 3' dia., 2'6" face, 75 H.P., 220 volt, motor, Herringbone gears, New condition.

MINE HOISTS: 150 H.P., 8'6" dia., 6'8" face; 250 H.P., 72" dia., 48" face; 200 H.P., double drums, one clutched, 8' dia., 4' face. All 3 phase, 60 cycle, 2300 volt with control equipment. Head Frame for double shaft 16'9" x 17'2", height 55', with or without 8' dia. sheaves for 1-1/2" rope. Other Hoists 100 H.P. to 1050 H.P., single and double drum with electric equipment.

A. J. O'NEILL
Lansdowne, Pa.
Phila. Phones: MAdison 3-8300—3-8301

BEST BUYS AT MEC

1—Buflovak 6' Jack. Vac. Crystallizer
3—Aluminum Bubble Cap Columns 27" and 36"
6—Bucket Elevators 8' to 40' overall
1—Devine 13 Shelf 40" x 42" Vac. Dryer
1—Stokes 6 shelf 24" x 36" Vac. Dryer
1—Stokes Dryer Double Drum 48" x 108"
1—Buffalo Dryer Double Drum 42" x 120"
5—Filter Press 18" to 42" Wd Plate & Frame
2—Sperry 36" Filter Presses, Hyd. Closures
8—Stainless Steel Jack. Kettles with Ag. 100 to 950 gals.
2—Cast Iron Jack. Kettles 250 & 800 gals.
1—Stainless Steel Jack. Mixer 75 gals.
1—Day D-8 Jack. Mixer—800# Cap.
1—W & P Mixer 100 gallon, Sigma Blades M.D.
3—Mikro Pulverizers 2 TH and 2 FF—10 H.P.
1—Gruendler W.B., Jr. 10 H.P., A.C. Motor
1—Robinson Size 1212, Rotary Cutter—10 H.P., A.C. Motor
1—Raymond 16" Screen Mill—5 H.P., A.C. Motor
2—Rotex Screens 40" x 60" and 40" x 120"
1—Robinson #16 Single Screen 40" x 104"
1—Stokes 43-A Granulator—S.S. Parts
1—Stokes Rotary "DD-3" Tablet Machine
3—Stokes "F" Single Punch Tablet Machines
8—Stainless Steel Tanks 100 to 5700 gals.
3—Horiz. Steel Tanks 3000 to 12000 gals.
6—Stokes 212C Vac. Pumps W.C. 100 C.F.M.

We have a complete stock for the Chemical and Process Industries. The above is only a partial listing. Send us your inquiries. We pay top prices for individual items to complete plants.

The MACHINERY & EQUIPMENT Corp.
933 West Broadway New York 12, N. Y.
GRamercy 5-6680

ROTARY VACUUM FILTERS

IMMEDIATE DELIVERY

3' dia. x 1' face, 10 sq. ft. filtering area, complete with all drives, motors and accessory units. Type 316 stainless steel. String or scraper discharge. Used, but in excellent condition. A few new units also available.

FILTRATION ENGINEERS, INC.
155 Oraton St. Newark 4, New Jersey
Phone: HUmboldt 5-4444

SPECIAL SALE

EIMCO 8'x8' FILTER

- New in 1946, used only two seasons.
- Closed drum, eqpd. with agit. trough.
- Nash Vac. Pump, 30 HP mtr. & slcr.
- Vac. receiver, blower, brmtrc. condsr.
- Complete with all piping & connect'ns.
- Cond. like new, can ship immediately.

Priced to Sell, F.O.B. Our Stock

MACHINERY AND EQUIPMENT CO.
[illegible] BRYANT STREET SAN FRANCISCO 7, CALIF.

BOILERS

10 to 5000 H.P.
Diesel, Steam Turbine, Engine

GENERATORS

Heavy Power Equipment
Industrial — Chemical Process Equipment

NEW — RECONDITIONED — USED
DEAN G. STRICKLER & ASSOCIATES
1346 Connecticut Avenue, N.W.
Washington 6, D. C. • DuPont 3366

LIQUIDATING
FORMER TEXAS COMPANY REFINERY
DALLAS, TEXAS

Pressure Vessels • Air Receivers • Tank • Kellogg Furnaces • Pipe • Valves & Fittings Steam Pumps • Hot Oil Pumps • Centrifugal Pumps • Electric Motors • Heat Exchangers Agitators • Instruments • Air Compressors • Stocks

WIRE—WRITE—PHONE
For Complete Catalog

All items priced attractively for quick sale as must vacate premises.

DALLAS REFINERY PROJECT
Box 5624 Phone Federal 6566 Dallas, Texas

FOR SALE

1—Four Effect Swensen Evaporator
1—Three Effect Swensen Evaporator with Salt Setting Tanks, etc.
1—Two-Stage Crystallizer
Pumps, vacuum equipment, piping

INSPECTION INVITED

MANGANESE, INC.
Box 2008, Henderson, Nevada

MOTORS, GENERATORS, TRANSFORMERS

1 — 1500 H.P.
Bought and Sold
New and Rebuilt

ELECTRIC EQUIPMENT CO.
ROCHESTER 1, N. Y.

IF

there is anything

you want . . .

that other readers of this paper can supply

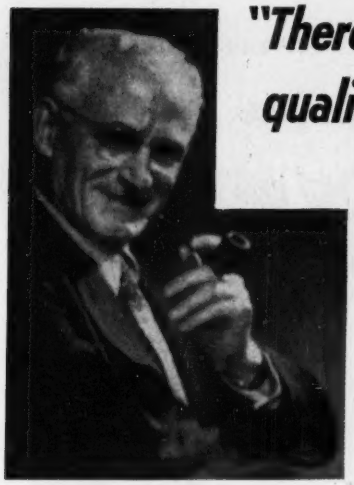
or—

something

you don't want

that other readers can use, advertise it in the

SEARCHLIGHT SECTION



"There's never a doubt about making a quality purchase when I buy it from LOEB"

★ You too will find that LOEB's 40 years of experience has a definite value for you in savings on your machinery purchases. Most any type of new or used equipment for the PROCESSING INDUSTRIES is available from our large stocks. All work is done here in our warehouse under expert supervision, and finished work is subject to close inspection. No sale is final until you are fully satisfied both in money saved and in the performance of the equipment. We strive to give you the RIGHT equipment at the RIGHT price.

●

Here's Why You Get a PLUS in VALUE from LOEB • • •

- long experience in buying and selling all types of PROCESS equipment
- large Chicago warehouse stock and a large nation-wide listing
- complete machine shop for thorough rebuilding
- an enviable reputation for fair dealing
- you save money in low purchase prices and quick delivery
- you make money selling your surplus equipment to us for cash or listing it with us for resale on a brokerage basis

WE BUY - - - WE SELL

★ SINGLE ITEMS
★ COMPLETE PLANTS

Ask to have your name put on our mailing list

●

Send Us Your List of Idle Equipment

Partial List of Current Values

1—5' x 36" Hardinge buhrstone lined continuous Pebble Mill.

3—5' x 12" Buflovac double drum Atmospheric Dryers.

1—30" Tolhurst imperforate basket suspended Centrifugal.

1—250 gal. working capacity Readco stainless steel double arm sigma blade Mixer with 50 hp. motor drive.

1—12 x 24" Farrel-Birmingham 2-roll Rubber Mill with 25 hp. drive.

1—New 3000 gal. vertical stainless steel Storage Tank.

1—Buflovac triple effect Evaporator, 300 sq. ft. per effect.

1—Pfaudler 3' stainless steel vertical tube Vacuum Pan.

2—Devine 5-shelf 42" x 42" vacuum shelf Dryers.

2—New Simpson #00 Intensive Mixers with stainless steel bowls and plows.

1—7' x 35' Direct Heat Rotary Dryer.

5—3000 gal. Pfaudler jacketed glass lined (dairy) vertical Tanks.

2—Day 100 gallon sigma arm jacketed Mixers.

50—Stainless steel Tanks (New and Used) up to 1000 gallons.

30—Stainless steel steam jacketed Kettles (new and used) up to 150 gallons.

4—J. H. Day 40 gallon Pony Mixers.

12—Filter Presses — recessed and plate and frame—from 7" to 30".

1—Buflovac 10 gal. jacketed agitated Autoclave—500 psi.

1—20 gal. Stokes stainless steel Vacuum Pan.

2—5 x 12' Buflovac vacuum Drum Dryers.

1—Day 3000 lb. jacketed Powder Mixer.

10—3000 gallon vertical closed Steel Tanks.

5—Day 12 x 32" 3-roll Mills.

3—Double drum Atmospheric Dryers—42 x 120", 32 x 90", 24 x 60".

6—6' x 40' Rotary Hot Air Dryers.

8—Dry Powder Mixers—100 to 3000 lb. capacity.

1—De Laval #600 Oil Purifier.

1—Buflovac 3-shelf 42 x 42" Vacuum Shelf Dryer.

1—New Ingersoll-Rand 14" x 7" Vacuum Pump.

1—24" x 48" stainless steel single drum Atmospheric Dryer.

1—Harris 6' stainless steel Vacuum Pan.

1—Charlotte W-10 stainless steel Colloid Mill with 1 hp. motor.

1—New Premier 3" stainless steel Colloid Mill with 7½ hp. motor.

1—Charlotte M-15 stainless steel Colloid Mill with 15 hp. motor.

2—Union Steam Pump stainless steel Reciprocating Pump, 60 GPM.

2—De Laval 54-81 motor driven Clarifiers.

1—250 gallon stainless steel Dowtherm Reactor.

1—100 gallon stainless steel jacketed agitated Reactor.

IT PAYS TO TRADE WITH LOEB

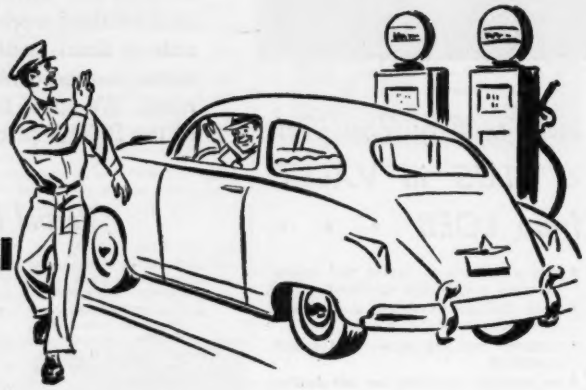
LIQUIDATORS • APPRAISERS
WAREHOUSE STOCK
NATION-WIDE LISTINGS

LOEB
EQUIPMENT SUPPLY CO.
1923 WEST NORTH AVENUE, CHICAGO 22

"SEE YOU AT THE POLLS!"

"SEE YOU AT THE POLLS!"

"SEE YOU AT THE POLLS!"



Nobody knows for sure how it started—this line about "See you at the Polls!" we're hearing all over these days.

Best explanation seems to be that it came from that state candidate out west. . . . His opponent in a debate got all riled up and challenged him to fight it out in the alley.

But he said—"I'll settle this the AMERICAN way—I'll see you at the polls!" And the audience picked up the chant.

Now everybody's saying it—and on Nov. 4 everybody will be *doing* it!

"SEE YOU AT THE POLLS!"

"SEE YOU AT THE POLLS!"

CHEMICAL ENGINEERING

(His business paper . . . of course)*

Any man with business on his mind puts his mind on his business paper. The **Best Informed Men in your Field** somehow *find* time . . . even when time's their scarcest commodity . . . to read, not a page or two, but thoroughly . . . not now and then, but regularly. Such reading pays off in new ideas, fresh approaches to tough problems, a constant touch with the market. To you, it can mean saving hours, cutting costs, finding better ways to do a job, keeping pace with new products, new materials, new tools. This business paper of yours is all business—your business. It follows the findings of the top men in your field . . . reports their most successful ideas . . . drops the solution to many a problem right into your lap. Be sure to read every issue . . . cover to cover . . . editorials and advertising. Both are jamful of news and "how-to" that will keep *you* one of the **Best Informed Men in your Field,** too.

The business paper in your hand has a plus for you, because it's a member of the Associated Business Publications. This means it is a *paid*-circulation paper which must *earn* its readership by the quality of its editing. It is one of a leadership group of business papers that work together . . . in editorial conferences and many a study and service project . . . to add new values, new usefulness, new ways to make the time you give to your business paper still more *profitable* time.

NEXT ISSUE the Best Informed Men in your Field will be reading . . .

SIZE REDUCTION

- Principles
- Equipment
- Applications
- Selection

A Chemical Engineering Report

One of a series of advertisements prepared by THE ASSOCIATED BUSINESS PUBLICATIONS

PORTABLE
PRACTICAL
pH

Versatile, efficient and *really* portable, the Marconi TF 889 pH Meter is designed for on-the-spot measurement. With a clear *direct-reading* scale covering 1 to 11 pH the instrument weighs only 8 lbs. including its protected glass electrode system—neatly stowed in the casing. Line or battery-operated.

MARCONI instruments

23-25 BEAVER STREET · NEW YORK 4

CANADA: CANADIAN MARCONI CO., MARCONI BUILDING, 2442 TRENTON AVENUE, MONTREAL
ENGLAND: HEAD OFFICE: MARCONI INSTRUMENTS LTD., ST. ALBANS, HERTS

Managing Agents in Export:
MARCONI'S WIRELESS TELEGRAPH COMPANY LIMITED, MARCONI HOUSE, STRAND, LONDON, W.C.2

Filter Paper

E&D Filter Paper

FOR SCIENCE AND INDUSTRY

As manufacturers of filter and absorbent papers we gladly place at your disposal our experience and skill in helping you select the proper paper for the problem confronting you. Or, if a new kind of paper is indicated, chances are we can produce it for you.

Call on us without any obligation.

The EATON-DIKEMAN Co.

"MANUFACTURERS OF FINE FILTER PAPERS"

Mt. Holly Springs, Pa.

PROFESSIONAL SERVICES 572

SEARCHLIGHT SECTION

(Classified Advertising)

H. E. Hilty, Mgr.

EMPLOYMENT
Positions Vacant 574, 575
Selling Opportunities Offered.....574, 575
Positions Wanted 575
Selling Opportunities Wanted..... 575
Employment Services 574

BUSINESS OPPORTUNITIES
Offered 575
Wanted 575

PROPERTY
For Sale 575
Wanted 575

EQUIPMENT
(Used or Surplus New)
For Sale 576-589

WANTED
Equipment 575
Miscellaneous 575

ADVERTISERS INDEX

Aaron Equipment Co..... 584
American Air Compressor Corp..... 582
American Technion Society..... 575
Barcan Co., Irving..... 582
Bauer, L. W..... 586
Belyea Company Inc..... 585
Benson-Wilimzig Inc. 586
Brill Equipment Co..... 581
Chemical Service Corp..... 575
Chemical & Process Machinery Corp.... 585
Consolidated Products Co., Inc.....576, 577
Continental Machinery & Equipment Co. 584
Dallas Refinery 588
Drake Personnel Inc..... 574
Electric Equipment Co..... 588
Epstein Peres 575
Equipment Clearing House Inc..... 582
Filtration Engineers Inc..... 588
First Machinery Corp..... 583
Gale C. J..... 575
Gelb & Sons Inc., R.....574, 578, 579
Harber Industrials 586
Heat & Power Co., Inc..... 587
Heineken, W. P..... 582
Herman Machinery & Supply Co..... 575
Herzog, H. A..... 575
Kehoe Machinery Corp..... 582
Lawler Machinery Corp..... 584
Loeb Equipment Supply Co..... 589
Loeb & Son, H..... 586
Luria Steel & Trading Corp., Erman-Howell Div. 586
Machinery & Equipment Co. (Calif.).584, 588
Machinery & Equipment Co. N.Y.C.).... 588
Manganese Inc. 588
O'Neill, A. J..... 588
Perry Equipment Corp..... 580
Philadelphia Transformer Co..... 582
Spencer Chemical Co..... 575
Stanhope, L. M..... 582
Stanhope, Inc., R. C..... 586
Stein Equipment Co..... 586
Strickler & Assoc., Dean C..... 588
Truland Chemical & Engineering Co.... 575
Union Standard Equipment Co..... 582
Walters Chemical Corp..... 586

ADVERTISERS INDEX

For more information about products of these advertisers, use Reader Service postcard in section following

A

Aerofin Corp. 308
Ajax Flexible Coupling Co., Inc. 140
Albert Pipe Supply Co.. LT520
Allegheny Ludlum Steel Corp. 72
Allen Bradley Co. 432
Allis-Chalmers Mfg. 22, 40 69, 366-367
Aluminum Co. of America.. 61
Amercoat Corp. 441
American Air Filter Co., Inc. 446
American Bitumuls & Asphalt Co. 309
American Brass Co. 291
American Car & Foundry Co. 79
American Cyanamid Co. 130-131
American Flange & Mfg. Co. Inc. 472
American Hard Rubber Co. 225
American Instrument Co... 306
American Mach. & Metals Inc., Tolhurst Div. 262
American Metal Hose 568
American Metal Spinning & Stamping Co. RT570
American Optical Co. 12
American Tool & Machine Co. 293
Ampco Metal Inc. 128-129
The Annin Co. 387
Applied Research Labs. 276
Arnold Dryer Co. 301
Atlas Mineral Products.... 316
Atlas Powder Co. 438
Autoclave Engineers Inc.. B338
Automatic Switch Co. T337

B

Babcock-Wilcox Co., Tubular Products Division.. 18-19
Bailey Motor Co. 411
Baird Associates Inc. 274
Baker Castor Oil Co. 415
Baker & Company 31, 496
Baker Perkins Inc. 74
Barrett Div. Allied Chemical & Dye Corp. 507
Beckman Instruments Inc.. 539
Bell & Gossett Co. 464
Bersworth Chemical Co. 498
Bethlehem Steel Co. 114
Bin-Dicator Co., The T334
Bird Machine Co. 9
Black Sivalls & Bryson, Inc. 365
Blaw-Knox Co. 21, 473
Blickman Inc. 310
Boston Woven Hose & Rubber Co. 460
Braun & Co., C. F. 54-55
Bridgeport Brass Co. 456
Bristol Co. 451
Brown Boveri Corp. 395
Brown & Root Inc. 269
Buffalo Forge Co. 405
Buffalo Meter Co. B337
Buflovak Eqpt. Div. of Blaw-Knox 434
Builders-Providence Inc.... 361
Butler Mfg. Co. 379

C

Cambridge Wire Cloth Co.. 554
Cameron Iron Works 305
Carbide & Carbon Chemicals Corp. 5
Carboloy 94-95
Carpenter Steel Co.... 141, 463
Carrier Corp. 84, 480
Cash Co. A. W. 8
Celanese Corp. of America. 505
Century Electric Co. 64
Chapman Valve Mfg. Co... 465
Chase Brass & Copper 482
Chemical Corp. 420
Chemical Construction Co., Inc. 538
Chicago Pneumatic Tool Co. 485
Chemsteel Constr. Co., Inc.. 571
Chicago Bridge & Iron... 90-91
Cleaver Brooks Co. 339
R. D. Cole Mfg. Co. T388
Cooper Alloy Foundry Co... 65
Corning Glass Works 49
Cowles Co. 567
C-O Two Fire Equipment Co. 474
Crane Co. 231, 263
Crouse-Hinds Co. 28-29
Croll Reynolds Co., Inc... 565
Crucible Steel of America.. 486
Cyclotherm Div. of U. S. Radiator Corp. B334

D

Darce Dept. Atlas Powder Co. 239
Darling Valve & Mfg. Co... 85
Darnel Corp. Ltd. L555
Davenport Machine & Foundry Co. B413
Davis Regulator Co.... LT552
Davison Chemical Corp.... 26
Day Co., The 377
Delanium Carbon Corp..... 89
DeLaval Separator Co.... 462
DeLaval Steam Turbine Co. 454-455
Deming Co. 390
Diamond Power Specialty Corp. 378
Dicalite Div., Gt. Lakes Carbon Corp. 271
Dings Magnetic Separator Co. 78
Dorr Co. 326-327
Dow Chemical Co., The.. 98-99 384, 400, 534
Downingtown Iron Works, Inc. 423
Dracco Corp. 419
E. I. DuPont de Nemours & Co., Inc., Orlon 433
E. I. DuPont de Nemours & Co., Inc. 549
Duraloy 397
Durametallic Corp. B414
Duriron Co., Inc. 317

E

Eagle-Picher Co. 363
The Eaton-Dikeman Co.... 592
Eclipse Fueling Eng. Co.. 374
Electric Steel Fdry. 45
Elliott Co. 80-81
Erb Mfg. Co. B298
Erie City Iron Works... 46-47
Esso Standard Oil Co. 399

F

Fairbanks-Morse & Co... 48 68, 506
Fairfield Eng. Co. 15
Falls Industries 393
Fansteel Mat. Corp. 281
Farrell-Birmingham Co. Inc. 545
Fenwal Inc. 458
Filtration Engineers, Inc... 536
Fischer & Porter 421
Fisher Governor Co. 531
Fletcher Works 132
Flexonics Corp. 58-59
Foote Bros. Gear & Machine Corp. 75
Foster Wheeler Corp. 82
Foxboro Co. 126-127
Friez Instru. Div. of Bendix-Aviation Corp. T412
Fuller Co. 484
Fulton Syphon Co. 435

G

Gardner-Denver Co. 30
Garlock Packing Co. 560
Gas Atmospheres Inc. 385
General Amer. Transp. Corp. 229, 267
General Chem. Div. Allied Chem. & Dye Corp. 111
General Electric Co. 24-25 444-445, 448-449
General Machine Co. of N. Jersey B416
Gifford-Wood Co. 427
The Girdler Corp. 257
Globe Steel Tubes Co. 513
Glycerine Producers Assoc. 450
Goodman Mfg. Co. T413
The B. F. Goodrich Co. 13
B. F. Goodrich Chemical Co. 7
Goodyear Tire & Rubber... 17
Gould-National Batteries Inc. 53
Goulds Pumps Inc. 353
Graphite Metalizing Corp. R540
Graver Tank & Mfg. Co.... 508
J. W. Greer Co. T298
Grinnell Co. Inc. 283

H

Hagan Corp. 511
Hammel Dahl Co. 4
Harrison-Walker Refractories Co. 32-33
Hardinge Co Inc. 357
Harper Co., H. M. The.... 490
Harrington & King Perforating Co. T426
Harshaw Chemical Co. 279
H. N. Hartwell & Son Inc... 6
John Hassall Inc. T529
Haynes Stellite 488
Heil Process Equip. Corp.. B418
Heinkeken Inc., W. P. 571
Helicold Gage, Div. Amer. Chain & Cable 308
Henszey Co. T416
Hercules Powder Co. 567
Heyden Chemical Corp. 253
Heyl & Patterson Inc. 321
Hills McCanna Co. L554
Homestead Valve Mfg. Co.. 510
Hooker Electrochemical Co. 62-63
Horn Co., Inc., A. C. 23
Howell Electric Motors Co. Inc. 467
Hudson Pulp & Paper Corp. 88

I

Illinois Electric Porcelain Co. B417
Illinois Water Treatment Co. 369
Ind. Filter Pump Mfg. Co.. 300
Industrial Process Engineers 406
Ingersoll-Rand 439, 483
Int. Engrg. Inc. 142
International Exposition Co. 330-331
Int. Nickel Co. 27, 452-453
International Paper Co. 375
International Salt Co. 512
I.T.E. Circuit Breaker Co. 108-109

J

Jarecki Valve Div. of H. K. Porter Co. 303
Jefferson Chemical Co. 355
Jeffrey Mfg. Co. 116-117
Jelliff Mfg. Co. LB552
Jenkins Brothers 528
Jerguson Gage & Valve Co. 422
Johns-Manville ..133, 251, 514
Johnson Corp. 562
Joy Mfg. Co. 71

K

Kaiser Aluminum & Chemical Sales 329
Keasbey & Mattison Co.... 509
The Kellogg Co. N. W.... 325
Kemp Mfg. Co. 354
Key Co. 73
Kidde & Co., Walter 252
Kinney Mfg. Co. 550
Kirk & Blum Mfg. Co. 404
Maurice A. Knight L546
Kold-Hold Mfg. Co. 247
Koppers Co. Inc. 240, R551
Koppers Co., Inc., Chem. Div. 115

L

La Bour Co. Inc. 499
LaFavorite Rubber Mfg. Co. LB530
Lapp Insulator Co. Inc. 360, 383
Layne & Bowler Inc. 515
Lee Metal Products Co.... T417
Leitz, Inc. E. L570
Leslie Co. 516
Link Belt Co. 11, 83
Liquid Carbonic Corp. 370
Liquidometer Corp. B426
Lukens Steel Co. 86
The Lummus Co. 442
Lunkenheimer Co. 333

M

Magna Mfg. Co., Inc. 571
R. C. Mahon & Co. 39
Manheim Mfg. & Belting Co. 518
Manning, Maxwell & Moore, Inc. 522
Marconi Instruments 592
Manzel Bros. Co. 389
Mason-Neilan Regulator Co. 124-125
Master Electric Co... 3rd Cover
Mathieson Chemical Co.... 113
McGraw-Hill Book Co.... 523
Mead Mill Co. T396
Mercoid Corp. LT571
Meriam Instrument Co.... L537
Merco Centrifugal Co. 364
Merck & Co. Inc. 403
Merrick Scale Mfg. Co.... 571
Merritt Chapman & Scott Corp. 245
Metal Goods Corp. 520
Metal Textile Corp. B396
Metalweld Inc. 437
Midwest Piping & Supply.. 70
Minneapolis-Honeywell Reg. Co. Industrial Div. 92-93 118-119, 295
Mitchell & Co. Inc. B418
Mixing Equipment Co. Inc. 233
Monarch Mfg. Works, Inc. L543
Monsanto Chemical Co.. 138-139
Morris Machine Works.... 362
Multi-Metal Wire Cloth Co. Inc. B398
Mundet Cork Corp. LB529
D. J. Murray Mfg. Co. 517

N

Nash Engrg. Co. 521
National Carbon Co. 42-43, 315
National Engr. Co. 120-121
National Filter Media Corp. 380-381
National Lead Co. 524
Naugatuck Chem., Plastics Div. of U. S. Rubber 457
Neptune Meter Co. 349
New England Tank & Tower Co. 382
Newark Wire Cloth Co. 373
Neville Co. The 541
Niagara Alkali Co. 319
Niagara Blower Co. 348
Nicholson Co., The 57
Nichols Engrg. & Research Corp. 290
Nicholson & Co. W. H.... B302
Nitrogen Division of Allied Chemical & Dye Corp.... 407
Nordstrom Valve, Div. Rockwell Mfg. Co.... 56, 223
North American Car Corp.. 544
Norton 35-38

O

Ohio Injector Co. 427
Oliver United Filters Inc. 102-103
Omega Machine Co. LT535
Oronite Chemical Co. 476
Owens-Illinois Glass Co.... 556

P

Pabco Products Inc. 285
Pacific Pumps Inc. 336
Packing Engineering Corp. R532
Pangborn Corp. 288-289
Parker Appliance Co. 440

INDEX CONTINUED ON PAGE 594

he's working for you

THIS FELLOW IS TRAINED IN YOUR BUSINESS. His main duty is to travel the country — and world — penetrating the plants, laboratories and management councils . . . reporting back to you every significant innovation in technology, selling tactics, management strategy. He functions as your all-seeing, all-hearing, all-reporting business communications system.

THE MAN WE MEAN IS A COMPOSITE of the editorial staff of this magazine. For, obviously, no one individual could ever accomplish such a vast business news job. It's the result of many qualified men of diversified and specialized talents.

AND, THERE'S ANOTHER SIDE TO THIS "COMPOSITE MAN," another complete news service which complements the editorial section of this magazine — the advertising pages. It's been said that in a business publication the editorial pages tell "how they do it"—"they" being all the industry's front line of innovators and improvers—and the advertising pages tell "with what." Each issue unfolds an industrial exposition before you — giving a ready panorama of up-to-date tools, materials, equipment.

SUCH A "MAN" IS ON YOUR PAYROLL. Be sure to "listen" regularly and carefully to the practical business information he gathers.

McGRAW-HILL PUBLICATIONS

ADVERTISERS INDEX

Continued From Page 593

Patterson-Kelley Co. Inc. . 525
Peerless Mfg. Co. B412
Peerless Pump Div. 471
Penberthy Injector Co. . . . 76
Penn. Flex. Tubing Co. . . . 41
Perkin-Elmer Corp. 408
Permutit Co. 100-101
Petro-Chem. Development Co. Inc. 353
Pfaudler Co. . . . . Back Cover
Pfizer & Co. Inc., Chas. . . . 424
Phila. Gear Works. 34
Phila. Quartz Co. T398
Phillips Petroleum Co. . . . 335
Pitts. Agricultural Chem. Co. Div. of Pitts. Coke & Chem Co. 342
Pitts. Corning Corp. 77
Pitts. Lectromelt Furnace Corp. 470
Pitts. Lectrodryer Corp. . . . 526
Porter Co., Inc., H. K. 303
Potts Horace T. Co. 44
Powell Co., Wm. 256, 564
Powers Regulator Co. 558
Prater Pulverizer Co. T394
Pressed Steel Co. T302
Pressed Steel Tank Co. 466
Proctor & Schwartz, Inc. . . 277
Proportioneers, Inc. 107
Prufcoat Labs Inc. 344
Pulverizing Machinery Co. . 237
Pyrene Mfg. Co. 352

Q

Quaker Rubber Corp. 287

R

Raybestos-Manhattan Inc. (Manhattan Rubber Div.) 478
Raymond Pulverizing Div. Combustion Engrg. Co. 134-135, 264
Read Standard Corp. 296,-297, 345
Reading Pratt & Cady Div. of Amer. Chain & Cable . . 243
Reeves Pulley Co. 491
Republic Flow Meters Co. . . 60
Republic Rubber Div. Lee Rubber & Tire Corp. 20
Republic Steel Corp. 527
Revere Copper & Brass Inc. 10
Richardson Scale Co. 468
Ric-Wil Co. 402
Rietz Mfg. Co. T414
Roots-Connersville Blower Corp. 254
Charles Ross & Son Co. . . R546
R-S Products Corp. 52
Ryerson & Son, Inc. J. T. 144

S

Safety Car Heating & Lts. Entoleter Div. L540
Sandvik Steel Inc. 477
Saralined Piper Co. . . . 384, 400
Sarco Co. Inc. RT537
Schutte & Koerting Co. . . . 431
Schutz-O'Neill Co. T338
Sharples Corp. 479
Shriver & Co. T. R555
Sier-Bath Gear & Pump Co. Inc. R543
Simpson Mix-Muller Div. 120-121
The W. W. Sly Mfg. Co. 236
Snap-on Tools Corp. 401
Smith, A. O. 14
Solvay Sales Div. Allied Chem. & Dye Corp. 359
Sparkler Mfg. 234-235
Spraying Systems Co. . . . RB537
Sperry & Co. D. R. 559
Sprout Waldron Co. . 372, L551
Standard Oil Co. 553
Standard Conveyor Co. . . . B394
Standard Steel Corp. 557
Sterling Electric Motors. . . 436
Stokes Machine Co., F. J. . . 469
Struthers Wells Corp. 87
Sturtevant Mills Co. 561
Surface Combustion Corp. . . 410
Superior Combustion Industries Inc. LB535
Sutton Steele & Steele Inc. . 392
Swenson Evaporator Co. . . . 311
Syntron Co. 562, 565

T

Taber Pump Co. R530
Tank Car Div., Gen. Amer. Transp. Corp. 229
Taylor Instrument Co. . . . 66-67
Terry Steam Turbine Co. The 519
Texas Gulf Sulphur Co. . . . 487
H. I. Thompson Co., The. R529
The Timken Roller Bearing Co. 461
Titeflex Inc. 307
Tokheim Oil Tank & Pump Co. 244
Tolhurst Centrifugal Div. Amer. Machine & Metals. 262
Traylor-Engrg. & Mfg. Co. 16
Treadwell Co. Inc., M. H. 136-137
Trent Tube Co. 533
Tri-Clover Machine Co. 351
Tube Turns Inc. . . . . 2nd Cover

U

Uehling Instrument Co. . LB571
Union Bag & Paper Co. . . . 429
Union Carbide & Carbon Corp. 5
U. S. Gasket. 282
U. S. Industrial Chemicals Co. 493-494
U. S. Rubber Co. 457, 569
U. S. Steel Co. 50-51
U. S. Stoneware Co. 104

V

Victor Chemical Works. 340-341
Virginia Smelting Co. 350
Visking Corp. . . . 312-313, 489
Vogt Machine Co., Henry. . 566
Vulcan Iron Works. 563

W

Walworth Co. 492
Warren Steam Pump Co. Inc. 481
Watson-Stillman 241
The Welsbach Corp. 447
Western Supply Co. 280
Westinghouse Electric Corp. 96-97, 122-123, 399, 347
Westinghouse Electric Corp. Air Conditioning Div. . . 459
Weston Elec'l. Instr. Corp. 356
Whiton Machine Co. B392
Whitlock Mfg. Co. 496
Whittaker Clark & Daniels Inc. RT562
Wiegand Co., Edwin L. . . . 475
Wiggins Gas Holder Div. of Gen. Amer. Transp. Corp. 267
Wigton-Abbott Corp. 391
Wiley & Sons, A. R. 548
Williams Patent Crusher & Pulv. Co. 255
Wilson, Inc., Thomas C. . . R535
Wilson Products Inc. L532
Winslow Scale Co. R552
Wolverine Tube Div. Calumet & Copper Co. 542
Worklon LB562
Worthington Pump & Mach. Corp. . . 500, 501, 502, 503, 504
Wyandotte Chem. Corp. . . . 443
Wyssmont Co. B388

Y

Yarnall Waring Co. . 371, T-392
York Corp. 497
Youngstown Welding & Engineering Co. 346

FOR CLASSIFIED INDEX SEE PAGE 592

Chemical Engineering Reader Service

The postcard inside back cover will bring you more information about new equipment, new products, new technical literature, and advertisements in this issue.

EDITORIAL INQUIRY SERVICE

- Circle key number of items about which you want more details.
- Fill out card completely, stamp and mail to us.
- Answers will come direct to you from companies.

NEW EQUIPMENT

New Fluids Handling Equipment

Pump Test Stand—Improves test accuracy, cuts time. De Laval Steam Turbine Co. 101

Injector Pump—Injects chemicals into pipelines at selected rate. Texsteam Corp. 102

Ball Valve—For positive shut-off up to 3,000 psi. The Foxboro Co. 103

Midget Solenoid Valve—With time delay mechanism. Automatic Switch Co. 104

Threadless Pipe Fittings—Used with stainless tubing. Cooper Alloy Foundry Co. 105

Batching Meter—Delivers pre-set amounts of liquid. Neptune Meter Co. 106

Diaphragm Control Valve—With special features at regular cost. Leslie Co. 107

Pump Priming Inductor—For centrifugal pumps in thirteen sizes. Nagle Pumps Inc. 108

Power Operated Valve—For air, oil or water operation, optionally automatic. Ledeen Mfg. Co. 109

Hydraulic Swivel Joints—Self aligning with 3,000 psi. rating. Barco Mfg. Co. 110

New Processing Equipment

Teflon Sheets and Tapes—In various thicknesses perforated. U. S. Gasket Co. 111

Dutch Centrifugal—Available through U. S. distributor. Heyl and Patterson Inc. 112

Centrifugal—Handles increased unbalanced loads. Tolhurst Centrifugals Div. 113

Automatic Sampler—Junior model for small tonnage plants. The Galigher Co. 114

Minature Filter—Pressure leaf type for filtration studies. Hercules Filter Corp. 115

New Instruments & Controls

Moisture Tester—For non-metallic granules or powders. Moisture Register Co. 116

Temperature Regulator—Regulates within 0.001 deg. F. Technical Equipment Co. 117

Radiation Recorder—Monitors continuous processes. Ohmart Corp. 118

Moisture Balance—Combines fast drying, accurate weighing. Central Scientific Co. 119

Pressure Transmitter—Operates on vibrating wire principle. Wright Engineering Co. 120

Vacuum Gage—Covers 8,000,000 to 1 range below 0.50 mm. Distillation Products Ind. Div. 121

Differential Colorimeter—Highly sensitive for process control. Manufacturers Engineering & Equipment Corp. 122

Hand Tachometer—For 25 rpm. to 30,000 rpm. O. Zernickow Co. 123

Viscosity Meter—Spindle type, 200 to 1 speed ratio. Brookfield Engineering Lab. Inc. 124

Combustion Meter—For exploring combustion zones. Phillips Petroleum Co., Instruments Div. 125

Flow Meter—Operates on open channels, either mechanical or electrical. Bristol Co. 126

Phantom Repeater—An instrument amplifier with extremely high input impedance. Keithly Instruments. 127

Omniometer—Measures radiation using any of common sensing elements. Radiation Counter Lab., Inc. 128

Autoscaler—Has completely electronic scaling circuit. Tracerlab, Inc. 129

Servo Amplifier—For extremely small current potentials. Automatic Temperature Control Co., Inc. 130

Demodulator—Rectifies A. C. control signal to D. C. meter input. Automatic Temperature Control Co. 131

Analogue Computer—Solves linear simutaneous algebraic equations. American Hydromath Corp. 132

Gage Stand—Aids precise measurement with thickness gage. Gardner Laboratory, Inc. 133

Bridge Balance—Has eight channels for use with strain gages. Consolidated Engineering Corp. 134

Electronic Timer—Times operations between 60 milli-seconds and 60 sec. General Control Co. 135

New Heating and Cooling Equipment

Infrared Oven—Constructed of complete pre-fabricated panels. Edwin L. Wiegand Co. 136

Vermiculite Insulation—Aids curing internal protective coatings. Zonolite Co. 137

Heat Exchanger—Double pipe type for corrosive solutions. Heil Process Equipment Corp. 138

Gas Aftercooler—Redesigned for increased capacity. Niagara Blower Co. 139

Cooling System—Uses maximum air, minmum water. Hudson Engineering Corp. 140

Combination Burner—Interchangeable for oil or gas. Eclipse Fuel Engineering Co. 141

Laboratory Oven—Circulates constant weight of air. Blue "M" Electric Co. 142

Oil Burner—Rotary horizontal design has high efficiency. Superior Combustion Industries, Inc. 143

Oil Burners—Models AM5-H and AM-H with 25 and 40 gph. capacities. Cleaver-Brooks Co. 144

New Packaging and Handling Equipment

Paper-Foil Drums—Multiple ply construction holds oil, grease. Pacific Steelfibre Drums Inc. 145

Conveyor System—Automatically empties, washes drums. Gifford-Wood Co. 146

Pneumatic Conveyor Tubes—Transfer messages and samples. Lamson Corp. 147

Fork Truck Drum Attachment—Rotates and tilts drums. Baker-Raulang Co. 148

Polyethylene Carboy—Combines lightness and toughness. Plax Corp. 149

Giant Belt Conveyor—Transfers coal from railroad to riverboat. United States Rubber Co. 150

Strapping Machine—Tensions uniformly, spotwelds joint. Acme Steel Co. 151

Shipping Cartons—Custom made in multi-side shapes. Gaylord Container Corp. 152

Plastic Covered Rollers—For corrosive applications. Samuel Moore & Co. 153

Lift Truck Carton Clamp—Handles wide range of unpalletized cartons. The Yale & Towne Mfg. Co. 154

Drum, Barrel Sling—Has 1,000 lb. capacity for drums, kegs and barrels. Palmer-Shile Co. 155

Bottle Banding Machine—Seals bottles with cellulose bands. American Machine & Foundry Co. 156

Packaging Machines—Uses plastic film for liquids and semi-liquids. Stokes & Smith Co. 157

Strapping Machine—Feeds ¾, 1¼, and 2 in. strap up to 10 fps. Signode Steel Strapping Co. 158

Combination Pallet—Can serve as pallet, stake pallet or materials box. Phillips Mine & Mill Supply 159

New Electrical and Mechanical Equipment

Electric Motor—With built-in heat exchanger. Reliance Electric and Engineering Co. 160

Entrainment Separator—Fits wide range of pipelines. V. D. Anderson Co. 161

Insulation Fastening—For pipes, tanks and ducts. A. J. Gerrard & Co. 162

Oil Filter—Has permanent, porous metallic medium. Permanent Filter Corp. 163

Variable Speed Transmission—New design for lighter powered units. Graham Transmissions Inc. 164

Diesel Engine—Operates on natural gas fuel. White-Roth Machine Corp. 165

Graph Paper—Perspective type for distortion-free drawings. Tech-Art Graphs 166

Roller Chain—With sintered bushings for built-in lubrication. Whitney Chain Co. 167

Tachometer Head—Heavy duty for low speed measurement to 199 rpm. Metron Instrument Co. 168

Variac Speed Control—For ¾ hp. compound motor speed control. General Radio Co. 169

Mercury Switch—Embedded in plastic to increase ruggedness. Minneapolis-Honeywell Regulator Co. 170

Snap Action Switch—Plastic potted for waterproof qualities. Minneapolis-Honeywell Regulator Co. 171

Variable Speed Motor—Fractional hp. A.C. with 10:1 ratio, 4 to 10,000 rpm. U. S. Electrical Motors 172

Rotary Sweeper—General purpose mounts on small cub tractor. Meili-Blumberg Corp. 173

Vacuum Cleaner Attachments—For high volume industrial cleaning. Multi-Clean Products, Inc. 174

Vertical Electric Motor—Has hollow shaft, accelerating type relay. U. S. Electrical Motors..... 175

Portable Fluorescent Magnifier—Has 2 or 4 power lens for industrial inspection. Stocker & Yale, Inc. 176

Loudspeaker—Has high intelligibility, mechanical and electrical ruggedness. Racon Electric Co. 177

New Safety Equipment

Emergency Showers—Mobile unit with combination of 14 sprays. Logan Emergency Showers, Inc. 178

Safety Lantern—Flashing or steady light for Class 1 Group D. Justrite Mfg. Co..... 179

Safety Goggle—With Vinylite frame and replaceable acetate lense. Willson Products, Inc. 180

Safety Goggle—Has transparent plastic frame. American Optical Co. 181

NEW PRODUCTS

Ceramic Paper—Superior electrical insulation from domestic sources. Naval Research Laboratory..... 201

Ethylene Carbonate—Offers a new route to making of agricultural chemicals. Jefferson Chemical Co.... 202

Acrylic Monomer—To make adhesives, dispersing and thickening agents. American Cyanamid Co. 203

Detergent—Produces foam which resists grease and other soils. Ninol Laboratories..... 204

Miticide—Kills mite eggs on citrus and deciduous fruit trees. Dow Chemical Co. 205

Paint Resin—Superior in color and as a deflocculating agent. Goodyear Tire & Rubber Co. 206

Resin-Fiberglas Tanks—To make fuel and water carrying tanks for truck mounting. American Cyanamid Co. 207

Fining Agent—Eliminates copper from wine thus preventing clouding. Cuvinex Co. 208

Insulating Powder—Minimizes ferrous pick-up in aluminum manufacture. Aluminum Ore Co. 209

Catalyst—Increases the molecular cross linking of heat reactive resins. Advance Solvents & Chemical Corp. 210

Polyvinyl Alcohol—To make water-proof adhesives, thickening agents. American Monomer Corp. 211

Ceramic Coatings—For heat exchangers, bellows, other process equipment. Solar Aircraft Co. 212

Protective Coatings—Resists acid, alkali and salt solutions. Lankote Div. 213

Alloy—Copper-phosphorous-silver alloy for efficient copper brazing. Westinghouse Electric Corp. 214

Laminate—Low pressure product. Lighter than aluminum, strong as steel. Russell Reinforced Plastics Corp.. 215

Chemical—Benzyl trimethyl ammonium hydroxide for resins, pharmaceuticals. Chemical Development Corp. 216

Chemical Stabilizer—For production of non-staining synthetic rubber. U. S. Rubber Co. 217

Synthetic Resin—Vinyl copolymer to increase tensile strength of cement. American Polymer Corp..... 218

Melamine Plastic—Combines high arc resistance with good chemical and mechanical properties. Synthane Corp. 219

Oil Additive—Permits efficient use of fuels with high sulphur content. American Cyanamid Co..... 220

NEW TECHNICAL LITERATURE

Los Angeles—What it offers new industries. 40 p. Los Angeles Dept. of Water & Power..... 301

Protective Coating—For exteriors and interiors of metal, wood, masonry. 4 p. Lasting Products Co. 302

Ball Bearings—Specifications for 120 types and sizes. 4 p. Miniature Precision Bearings Inc. 303

Pipe—Tables give dimensional properties of available sizes of steel pipe. 12 p. Tube Turns, Inc. 304

Plastic—Progress report on Kel-F, high temperature plastic. 4 p. M. W. Kellogg Co. 305

Alloy—How Worthite is used against various corrosive chemicals. 26 p. Worthington Corp. 306

Heat Seal Coatings—Formulas for use on paper, cellulose acetate. American Resinous Chemicals Corp. 307

Evaporator—Applications of continuous, turbulent thin film concentration in a single pass requiring but seconds. 4 p. Rodney Hunt Machine Co. 308

Resins—Application data and starting formulations. 16 p. Hercules Powder Co. 309

Nitrocellulose—Studies in solubility, 20 charts. Uses. 12 p. Hercules Powder Co. 310

Oil Refining—Photographs of the units in the first British-built cat cracker. 20 p. Whessoe Ltd. 311

Methanol—Properties, uses, chemical reactions, toxicity, handling. 2 p. Commercial Solvents Corp. 312

Resins—Styrene modified alkyd-type—their development for particular use. 16 p. Monsanto Chemical Co... 313

Instruments—Unitized optical and electronic components. 24 p. Perkin-Elmer Corp. 314

Instruments—Infrared spectrometer, its applications and requirements. 32 p. Perkin-Elmer Corp..... 315

Valves—Integral seat all-purpose forged steel rated for 1,500 and 2,500 lb. 8 p. Edward Valves, Inc. 316

Hydraulics—Story of progress and application to American industry. 32 p. Hydraulic Press Mfg. Co. 317

Materials Handling—Extension back rests for lift trucks 2 p. Towmotor Corp. 318

Materials Handling—Tiering truck which eliminates counter-weight. 2 p. Raymond Corp. 319

Dryers—Packaged unit, vertical continuous transfer type. Photographs, cutaway. 4 p. Wyssmont Co. 320

Metal Finishing—Individual treatment of a line of specialized products. 6 p. Kelite Products Co. 321

Aldehydes—Specifications and typical uses of acetaldehyde, n-butyraldehyde, crotonaldehyde and isobutyraldehyde. 4 p. Tennessee Eastman Co..... 322

Stainless—Where it is used in the chemical process industries. 34 p. Allegheny Ludlum Steel Corp. 323

Electrometers—Measurement of potentials, currents, capacitance, resistance. 8 p. Keithley Instruments... 324

Vacuum Drying—Typical problems and their solutions. 24 p. F. J. Stokes Machine Co. 325

Pump—Self-contained, high-pressure hydraulic power source. 6 p. Kobe Inc..... 326

Mildewproofing Agents—Brief summaries of many government specifications. 26 p. Witco Chemical Co..... 327

Plastics Molding Press—Speed, molding action and feed. 4 p. F. J. Stokes Machine Co. 328

Process Equipment—Photos, cutaways of jacketed steel dryer rolls. 8 p. Lukenweld Div. 329

Combustion Equipment—Photos of production and maintenance applications. 12 p. Hauck Mfg. Co..... 330

Dust Collector—Applications of a low cost, self-contained bag-type model. 4 p. Aget-Detroit Co. 331

Electric Tractor—Cross-sectional drawing and photos of heavy-duty model for industrial towing applications. 4 p. Yale & Towne Mfg. Co. 332

Valves—Safety relief model for hot water boilers. 4 p. A. W. Cash Valve Mfg. Corp. 333

Process Equipment—Air operated controlled volume pumps, chemical feed systems. 24 p. Milton Roy Co. 334

Continuous Weld Pipe—Picture story and flowsheet on manufacture. 36 p. Wheeling Steel Corp. 335

Instruments—Recorder for stack smoke density and combustion performance. 2 p. Ess Instrument Co..... 336

Gas Burner Nozzles—For any usual fuel gases. Construction diagrams. 4 p. Hauck Mfg. Co. 337

Ferritic Steel—Tables give mechanical properties, heat treating effects. 12 p. International Nickel Co..... 338

Nickel—Wide range of mechanical properties of electrodeposited nickel. 12 p. International Nickel Co.... 339

Extruders—Specifications of four models; diagrammatic views. 4 p. Allen Extrusion Machine Div. 340

Protective Coatings—Properties, uses, test data. 44 p. Insul-Mastic Corp. of Americh..... 341

Filters—Selection. Operation construction and standard sizes. 16 p. General American Transportation Corp. 342

Instruments—Recorders and controllers for a variety of uses. 48 p. Leeds & Northrup Co. 343

Plasticizers—Specifications, typical properties, compatibility. 22 p. Dow Chemical Co. 344

Instruments—Amplifier for oscilloscopes and vacuum tube voltmeters. 4 p. Keithley Instruments..... 345

Metallic Stearates—Specifications of many grades. Applications. American Cyanamid Co. 346

Pumps—How various members of a line operate. Combinations, permutations. 38 p. Yale & Towne Mfg. Co. 347

Instruments—Vacuum tube electrometers and accessories. 8 p. Keithley Instruments..... 348

Instruments—Operation of hand, portable and fixed installation tachometers. 4 p. Metron Instrument Co.... 349

Materials Handling—Casters and wheels for varied loads 36 p. Rapids-Standard Co. 350

Interoffice Telephones—Case histories illustrate their efficiency. 8 p. Automatic Electric Co. 351

Manometers—Installation, operation and maintenance. 12 p. King Engineering Corp. 352

Fans—Direct motor driven fans for exhausting fumes or gases which are abnormally hot, corrosive flammable. 8 p. DeBothezat Fans Div..... 353

Paper—Crinkled kraft for multi-wall bags, wrapping, liners. 6 p. National Waterproof Papers, Inc..... 354

Belting—Of hinged steel for handling metal scrap, hot forgings. 4 p. May-Fran Engineering, Inc..... 355

Milling Equipment—For the chemical and plastic industries. 16 p. Allis-Chalmers Mfg. Co. 356

Dust Collectors—Vol. 1, No. 1 of a house organ devoted to cloth tube-type models. 4 p. American Wheelabrator & Equipment Corp. 357

Equipment—Conveying, processing and power transmission machinery. 16 p. Link-Belt Co. 358

Steel Castings—Summary chart covering 70 designated classes. Steel Founders' Society of America..... 359

Packaging—Pressure sensitive plastic tape you can write on. 6 p. Labelon Tape Co. 360

Aluminum Alloys—Composition, typical mechanical properties, heat treatments. 24 p. Apex Smelting Co. 361

Plastics—Application of precipitated calcium carbonates in reinforced plastics. Effects on properties. 21 p. Diamond Alkali Co. 362

Motor Control Centers—Large labeled photograph, layout diagram. 6 p. Continental Electric Equipment Co. 363

Industrial Lighting—Principles and economics for specific areas. 96 p. Holophane Co. 364

Safety—How to choose the right protective glove for the job. 16 p. Pioneer Rubber Co..... 365

Pumps—Air pressure of vacuum pumps for the laboratory. 6 p. Eberbach Corp. 366

Protective Coatings—Heavy-duty transparent coating. Use photos. 22 p. Tropical Paint & Oil Co. 367

Roofing—Metallic aluminum coating for roofs. Where, how to use. 12 p. Tropical Paint & Oil Co. 368

Aluminum Paint—For protection of hot metal surfaces. Performance. 4 p. Tropical Paint & Oil Co. 369

Rust Preventative—Primer for iron or steel surface. 12 p. Tropical Paint & Oil Co. 370

Graphitization—Control of the phenomena met in systems operated at elevated tempelature in the power and processing industries. 12 p. Edward Valves, Inc... 371

Flow Meters—Dimensional diagrams and photos of various models. 12 p. Fischer & Porter Co. 372

Instruments—Pneumatic control for holding paper stock at specified pH. 12 p. Leeds & Northrup Co. 373

Office Machine—For moderate copy production in drafting rooms, offices. 4 p. Chas. Bruning Co. 374

Food Processing—Technical data, packaging information, background materials on products like vitamins, acidulants, anti-oxidants. 71 p. Chas. Pfizer & Co.. 375

Sugar—Description of the sugar cube process and equipment used. 8 p. Standard Steel Corp. 376

Pumps—Applications, design, operation of controllable capacity pumps. 8 p. Aldrich Pump Co. 377

Tubing—Cold-drawn carbon steel mechanical tubing. 4 p. Babcock & Wilcox Co. 378

Chemicals—Lists 189 better known chemicals offered in 5-gal. units. Matheson Co. 379

Valves—Operating sequence, installation arrangements of various altitude control valves. 16 p. Golden Anderson Valve Specialty Co. 380

Sodium Dispersions—Preparation, properties and uses. 4 p. National Distillers Chemical Co. 381

Alkyl Phosphites—Applications, properties, uses. 14 p. Virginia-Carolina Chemical Corp. 382

Sludge Disposal—System for drying and incineration. 22 p. Combustion Engineering-Superheater, Inc. 383

Mixers—Designed for processing a wide range of materials. 4 p. Struthers Wells Corp. 384

Isopropyl Ether—Tabular data on properties. 8 p. Shell Chemical Corp. 385

Protective Coating—Illustrations show use on 19 types of masonry. 20 p. Arco Co. 386

Plasticizer—For organosols and plastisols, extruded goods. 6 p. Carbide and Carbon Chemicals Co. 387

Materials Handling—Shovel-type scoop for handling loose materials. 2 p. Towmotor Corp. 388

Conveyors—Mechanical vibrating type. Operation and installation photos. 12 p. Jeffrey Mfg. Co. 389

You can get, free, more information about any of the following advertisements.

Note: Mail the postcard inside the back cover to us. Answers will come direct to you from the companies. There is a page number on the postcard for each advertisement. Here's what the letters mean: L, R, T, B, (left, right, top, bottom) locating the ad on the page; small letters following, (a, b, c) indicate additional products in the advertisement. On the card, circle the page numbers of any items, below, about which you want more details.

Page

Air cleaning & dust recovery equipment
- Air filters, bulletin 510 446
- Blast cleaning cabinets 289a
- Blast cleaning machines 289b
- Dust collection equipment 237c
- Dust collectors L540
- Dust collectors, bulletin 98 236
- Dust collectors, unit type 289c
- Dust control equipment 288
- Dust control filters 419
- Dust filters 377
- Fog filters 39b
- Fume washers L546
- Hydro-finish cabinets 289d
- Wet & Dry collectors 39a

Air conditioning equipment
- Blowers
  - Axial flow, positive pressure for chemical processing 345a
  - Axial flow, positive pressure for diesel engines 345c
  - Axial flow, positive pressure, for sewage plants 345b
  - Centrifugal 80–81b
  - Centrifugal & rotary positive 254
- Fans
  - Aerodynamic design R551
  - Exhaust, bulletin M-7/1103 ..... 317e
  - Exhausters, blowers & ventilators 405
  - Humidity conditioning 410
  - Radioactive atmosphere 459
  - Refrigeration equipment 503

Apparel, industrial, orlon BL562

Autoclaves, horizontal jacketed, with helical type agitation 473e

Autoclaves, vertical, for curing safety glass 473a

Autoclaves B338

Batteries, industrial truck 53

Beakers & pots, stainless steel TR570

Bearings, oilless R540

Belts
- Conveyor, oil-resistant rubber 17
- Conveyor, woven wire R554
- Grommet 13
- V, veelos 518

Bends 495a

Boiler units, packaged B334

Building materials, corrugated asbestos, transite 133

Buildings, steel 379

Brine processing, handling, storage, and applications 512

Bubble caps, bulletin 21 ..... T302

Calendars, rubber & plastic 545b

Carbonator, rotary, jacketed 473f

Car loader 372

Career opportunities, scientific and technological, in petroleum and petrochemical industries 375

Casters L555

Page

Castings
- High alloy 397
- High alloy, government regulation 65m
- Molybdenum bearing, stainless alloy 65k
- Stainless steel, in the paper industry 65g
- Stainless steel, newscast 65q

Catalysts, platinum metals 31

Catalyst supports
- Alundum 35–38a
- Crystolon 35–38b
- Magnorite 35–38c
- Mullite 35–38e
- Zirconia fused stabilized, bulletin 1409 ..... 35–38d

Centrifugals 74b, 132, 262, 293, 462

Centrifugals
- Automatic, for crystal recovery and dehydration 479e
- Booklet 5-RC-2 321
- Bowl type, high capacity 479f
- Continuous solids discharge, DV-2 ..... 479d
- Disc type bowl, nozljector 479a
- Disc type, D-2 ..... 479c
- Tubular Bowl 479b

Chemical Industries Exposition 330–331

Chemicals
- Acrylonitrile and other chemicals for the rubber industry 130–131a
- Alcohol ester, sterox 110 ..... 138–139k
- Alcohol solvent, solox 493–494
- Alumina 61
- Aluminas, calcined & hydrated 329
- Aminoethyl ethanolamine 5e
- Ammonia, anhydrous 62–63a
- Antibiotics 403c
- Aroclors, bulletin P-115 ..... 138–139h
- Aroclars as co-plasticizer, bulletin P-131 ..... 138–139j
- Aroclars in chlorinated rubber, bulletin 124 ..... 138–139i
- Aroclors in Pliolite S-5, bulletin P-126 ..... 138–139g
- Benthal 138–139o
- Benzoic acid 138–139n
- Benzotrifluorides 62–63i
- Benzyl chloride, bulletin 0-80 ..138–139b
- Carbose 442
- Carbon dioxide 370
- Carbonate of potash 319c
- Castor oil and its derivatives 415
- Catalysts, fluid cracking, synthetic 130–131f
- Caustic potash 319b
- Caustic soda 62–63c, 319e
- Chlorine 62–63b
- Chlorine, liquid 319a
- Coal-tar 507
- Cortisone 403a
- Descaling salt 62–63i
- Diethyl malonate 534
- Diethylene triamine 5b

Page

- Ethylene diamine 5a
- Fine 111b
- Fine, dyestuff manufacturing 343
- Fluorides 279
- Formaldehyde 253a
- Glycerine 450
- Heavy 111a
- Hexachlorocyclopentadiene, C-56 ..62–63g
- Hexamethylenetetramine 253c
- Industrial and agricultural 26
- Laboratory 111c
- Lindane 62–63d
- Melanne resins 130–131c
- Molten cleaner, virgo 62–63k
- Nitrogen products 407
- Oils 541b
- Ortho-ethyinitrobenzene 138–139e
- Ortho-nitrobiphenyl, bulletin 0-78 ..... 138–139d
- Oxidants, ozore 447b
- Paradichlorobenzene 319d
- Paraformaldehyde 253b, 505
- Petroleum processing 113
- Petroleum solvents 399
- Pentachlorophenol, penta 138–139f
- Phenol 98–99
- Phosphate rock 130–131g
- Phosphoric acid 138–139m
- Plasticizer for vinyl chloride formulations, MPS-500 ..... 62–63j
- Plasticizers, santicizer 3, bulletin 0-81 ..... 138–139c
- Polyester resins 130–131d
- Polyester resins, vibrin 457
- Polymers, addition, uorolubes ..62–63h
- Propylene carbonate 355
- Polymers, addition, fluorolubes ..62–63h
- Propylene carbonate 355
- Reagents, aerofloat 130–131e
- Resins 541a
- Resins, Geon 404, bulletin G-6 7
- Resorcinol, U.S.P., bulletin C-2-124 ..240
- Santobrite 138–139a
- Silicates of soda T398
- Sodium gluconate 424
- Sodium phosphates 138–139l
- Sodium trichloacetate 62–63e
- Sodium tripolyphosphate 340–341a
- Solvents 541c
- Sorbitol 438
- Specialties 541d
- Sulfur dioxide 350
- Surface active agents 476
- 1, 2, 4, 5-Tetrachlorobenzene 62–63f
- Tetrachloro phthalic anhydride 319g
- Tetraethylene pentamine 5d
- Tetrasodium pyrophosphate ..340–341b
- Trichlorethylene 319f
- Triethylene tetramine 5c
- Urea resins 130–131b
- Versenes, bulletin 2 498

Circulation systems, forced utilizing Dowtherm 87

Clad steels 86

Clarifiers and thickeners 357c

Closures, drum, tri-sure 472

Coatings
- Protective
  - Bitumastic 115
  - Rubber-base R-567
  - Vinyl coating, primer P-50, bulletin 015 344
- Weather-coated 363d

Coils 495b

Compressors
- Air, single & double stage 30
- High-pressure 483

Page

Horizontal duplex....485
Horizontal, type DC....500
Concentrators....84
Condensation return units, bulletin 4400....390
Conduits, electrical, everdur, publication E-12....291
Conduits, motor starter & circuit breaker type EPC, bulletin 2634....28–29
Connectors, flexible metal....568
Containers
Bags, multiwall....375, 429
Sacks, multiwall....88
Stainless steel....466
Conveyors
Dry materials....484
General line, bulletin 308....B394
Multi-tier....T298a
Pan, enclosed....116–117d
Screw....83
Shaker....T413
Steel belt....477
Vibrating....140
Vibrating, mechanical....116–117f
Coolers
Cascade, pyrex, bulletin P-E....49
Indirect, electric vibrating....116-117h
Rotary, bulletin 115....16
Den and excavator....561e
Disintegration equipment
Ball mills....142e
Conical and tricone mills....357a
Disintegrators....T414
Grinding equipment....237a
Hammer mills....255
Impact mills....T396
Mills....545c
Pulverizer, model G5S....T394
Pulverizers....T338a
Ring roll mills....561a
Roller mills....134–135, L551
Rotary pulverizer, tailings....561b
Distillation equipment, compression....339
Drives, power, bulletin HGB....75
Dryers and drying systems, bulletin -361 and 342....277
Dryers
Continuous, vertical....B388
Cyclo-matic....301
Direct fired....B413
Double drum, vacuum, stainless steel..434
Flash, catalog 54A....264
For powdered resins....526
Freeze, vacuum....469
Ruggles,coles....357b
Starch, bulletin 508....557
Spray....311
Ejectors, air, water or steam operated, bulletin 512....76d
Electrical power systems, high-voltage....444–445
Engineering and construction
Chemical plants....21
Chemical process plants..54–55, 245, 442
Mercury cell chlorine plants....136–137
Plants....269
Plants, bulk material storage & handling facilities....57
Process plants....391
Process plants and equipment....406
Steel plate structures....90–91
Sulphuric acid plants....538
Engineering and design, heat transfer apparatus, votator, bulletin V-48....257
Engines, diesel....48
Evactors, steam jet....TR565
Fabricators
Conveyor systems, bulletin 152....15
Corrosion resistant liners....14
Glassed steel equipment....602
Heat exchangers....325
Pipe, piling and pile fittings....TL530
Piping....283, T418
Pressure cookers....526
Pressure vessels, forged-steel....114
Stainless steel....310
Stainless steel vacuum tanks....423
Tanks....T388
Tanks and processing equipment, stainless steel....B298
Wire cloth filter leaves....B398
Fastenings, non-ferrous metals & stainless steels....490
Feeder-conveyor-elevator, booklet 217..11
Feeder, spreader, electric vibrating....116–117c
Feeders
Chemical....389
Chemical, solution, dry material..TL535
Electric vibrating, open-pan deck, No. 3....116–117b
Electric vibrating, small capacity, No. 1-b....116–117a
Pneumatic, "adjust-o-feeder"....107
Vibratory....L565
Water-cooled, No. 4-L....116–117e
Feeding, batching & proportioning, Waytrol....116–117g
Fibers, acrylic, orlon work clothes....433
Filter aids & fillers, dicalite calcined & processed....271
Filter cloth, metallic....373
Filter covers, fabric....381

Page

Filter media
Activated carbon, Darco-G-60....239
Bonded textile fiber, viskon....489
Porous alundum shapes, bulletin 140....35–38g
Synthetic fiber....380
Filter presses....R555, 559
Filters
Continuous vacuum....102–103
General line....9
Horizontal plate....234–235
Stationary....300b
Vacuum rotary pilot plant, with stringe discharge stainless steel..536
Filtration & insulation material, refrasil....R529
Fire extinguishing systems
Carbon dioxide, low pressure....474
Hand, automatic....352
Packaged....252
Fittings & valves, corrosion resistant, flanged, SP-42....65a
Fittings
Corrosion-resistant....44
Forged steel, screw-end & socket-weld....241
Stainless steel, quikulp....65n
Welding....2
Welding, alloy....73
Furnace
Electric, 60-ton, catalog 8....470
Multiple hearth....290
Gasholders, bulletin WG-22....267
Gaskets, goetze....514
Gaskets, teflon....282
Gas scrubbers, supplement 4-RA....421
Generators
Gas, inert....354, 385
Oxygen....71
Steam....46–47, 353a
Steam, catalog 322....BL535
Synchronous....80-81d
Turbine....80–81b
Gilsonite, barber....309
Glass, heat-absorbing, flow protecting-movie-film....12c
Heat exchange pebbles, alundum....35–38f
Heat exchangers....280, 308, 495c
Heat exchangers
Aero, bulletin 120....348
Cubic graphite....89
Durco....317d
Film type, bulletin HE-7....566
Hydro-flo....464
Impervite tube....393
Heaters
Electric
Air blast....475a
Duct, high temperature....475c
Finstrip....475b
Feedwater, deaerating....80–81e
Gas cracking....353d
Indirect, dowtherm....353b
Unit, catalog BC-1049....517
Heat transfer equipment, Platecoils, bulletin P61....247
Hooks, flexible metal, for removing packings, bulletin DHCE....B414
Hose
Flexible metal....58-59, 307a
Fire, rubber....20
Rubber, homoflex, bulletin 6879D....478
Steam, No. 20....460
Instruments
Bin level indicators....T334
Control systems, pneumatic, plug-in....66–67
Controllers & Recorders, consotrol, bulletin 463....126–127
Controllers
Flow ratio....421
Liquid level....531
Pneumatic....124–125
Differential pressure control....TR571
Electronic recorder continuous-balancing....451
Flow meters....411
Flow meters
Indicating....T416
Propeller-type....361
Gages
Absolute pressure....L537a
Bourdon tube materials....522
Flat glass....422
Helicoid....328
Hydrostatic....BR571b
Liquid level with "floating shank"..76a
Tank....B426
Transparent, catalog 35....76b
Hb-meter....12b
Level control installations, floatless..516
Liquid meters
Bulletin 566-M....349
Electricontact....B337
Manometers
U-type....L537b
Well type, front-of-broad mounting....L537d
Well type, table mounting....L537c
Ph meters, portable....TR592
Plant stream analyzer....274
Pressure pilot controller, bulletin 16-1....92–93
Quantometers, production control...276

Page

Recording & controlling, for fractionating operations....118–119
Regulators, 923-G, catalog GG-A....435
Ring balance meters....511
Spectrophotometer
Bulletin 235....539
Infrared....408
Tank meters....BR571a
Temperature & humidity control....568
Thermal controls....458
Thermistors....T412
Thermometers, all metal....356
Transmitters, differential, pneumatic..60
Insulation
Blankets....363b
Block & pipe covering, 85% magnesia....BL529
Blocks, high-temperature....509b
Cellular glass....77
Cement....509a
Cement, rust-inhibitive....363c
Heat, calcium silicate....556
Heat, 85% magnesia....285
85% magnesia....509c
Temperature, high blocks, mineral wool....363a
Kettles
Corrosion-resistant....T417
Reaction, electro-vapor heated....473g
Kilns, rotary....663
Laboratory ware
Alundum, bulletin 793....35–38i
Platinum....496
Lenses, safety-goggle....12a
Liners, drum and carton, polyethylene, visqueen....312–313
Linings, rubber, Permobond....569
Linings & coverings, rubber....BL530
Lubricants, industrial oils, stanoil....553
Magnets, trampiron....78b
Materials handling systems....437
Materials of construction
Alloy, heat resistant....65i
Alloy reference chart....65e
Alloy type 17-4PH....65v
Alloy type FA-20....65t
Alloy type 25-12....65s
Aluminum bronzes, for heat exchangers, etc....128–129
Carbon and graphite....42–43a
Cast monel, uses....65l
Cast stainless alloys....66j
Cast steels....333a
Cements, corrosion-resistant, bulletin 5-2....318
Chrome, carbide, carboloy, bulletin WR-104....94–95
Chrome type alloy—12–14%....65u
Chemical porcelain with fiberglass, for process equipment....383
Clad steels....86
Copper-base alloys....456
Copper and copper alloys....10
Durco alloys, catalog 53....317f
Fiberglas, for exhaust systems....420
Hastelloy alloy B....488
Impervious graphite....42–43b
Lead, sheets....524
Metals, complete line....520
Nickel alloys....452–453
Nickel alloyed bronzes....27
Plastic, tygon, for equipment handling ammonia compounds....104
Plastic for corrosion-proof liners....6
Porcelain for fluid handling systems....B417
Rubber for packing....287
Rubber, hard for self-priming pumps..225
Seran rubber for tank linings....384
Selection chart....65d
Stainless alloys, technical topics....65r
Stainless steel....72
Stainless & heat-resisting steel....627
Stainless steel for cosmetic process equipment....50–51
Stainless steel for pipe, fittings, etc..45
Stainless steel No. 20....141
Stainless steel, rezistal 430....486
Stainless steel, straight-chrome....144
Steel for tubes....461
White enamel, fumex....23
Microscope-camera, polarizing panphot....L570
Mineral fillers, celite....251
Mist elliminators, knitted wire....B396
Mixing equipment
Agitators....382
Agitators, top entering....142g
Agitators, turbine....142a
Blenders
Dry....142b
Granulation, stainless steel....473d
Water, catalog 800....TR537
Blending equipment....237b
Dissolvers....L567
Mixer-kneader, ko-kneader....74c
Mixers
Banbury....545a
Change can....R546f
Change tank....R546g
Double-arm....296–297
Dry....R546b
Dry batch....561c
General line, bulletin B-100....233d

Page

Heavy duty, paste R546d
Heavy duty, steam-jacketed ..R546h
Horizontal R546i
Laboratory 74a, R546e
Laboratory, bulletin DH-50 .....233f
Laboratory, 18" pan dia.....120–121d
Laboratory, 24" pan dia.....120–121c
Liquid R546a
3' pan dia., No. 0.....120–121a
4' pan dia., No. 1.....120–121j
6' 8" pan dia., No. 2F.....120–121g
6' pan dia., No. 2.....120–121e
8' pan dia., No. 3.....120–121f
8' 4" pan dia., No. 3F.....120–121h
24" pan dia., No. 00.....120–121b
Portable 142c
Portable, bulletin B-75.....233e
Portable, 3' 3" pan dia.....120–121i
Ribbon 142d
Semi-portable, No. 14.....120–121k
Side-entering 142f
Side entering, bulletin B-76.....233c
Top entering, propeller type, bulletin B-73.....233b
Top entering, turbine & paddle type, bulletin B-102.....233a
Twin, semi-paste.....R546c
Motor pulley, vari-speed.....491
Motor starters
Automatic reversing, bulletin 705..432a
Circuit & motor protecting....122–123a
Combination, bulletin 713.....432c
Heavy duty, bulletin 800.....432d
Solenoid, bulletin 709.....432b
Motors
Capacitor 601c
Direct current 601e
Explosion-proof.....80–81i, 96–97, 467
Gear 122–123b
Gear, catalog GM-48.....34
Pre-lubricated, life-line, bulletin B-4378 347
Protected 64
Repulsion induction.....601d
Slip ring 601b
Squirrel cage 601a
Synchronous.....24–25, 80–81c, 601f
Tube-type, bulletin 51B7149.....40
Nails, rivets, screws, cold headed, corrosion-resistant TL529
Nozzles
Spray L543

Page

Spray, catalog 22 & 23.....BR537
Ovens
Electric laboratory type, automatically controlled 404b
Gas fired, automatically controlled..404a
Ozonators, laboratory 447a
Packings & gaskets, teflon.....560
Pilot plant, resin, electro-vapor heated 473b
Pipe flange shields, transparent.....R532
Pipe & ducts, acid proof solid plastic B418
Pipe & fittings, acid proof, durco, bulletin PF/1.....317c
Pipe, saran lined steel.....400
Piping
Insulated, section 480-6.....402
Prefabricated 70
Power drives, electric, bulletin D-119..436
Pressure vessels.....495d
Pumps
Acid 548
Centrifugal
Bulletin CL-339.....R530
Corrosion-resistant alloy.....501
Durco, bulletin P/1.....317b
Non-lubricating 351
Self-priming 499
Side suction.....506
Stainless steel, bulletin 725.3.....358
Chemical transfer, type CTB, bulletin B-1606.....471
Cycling jet, bulletin 5030.....76c
Hand, double-action.....244
Metering & proportioning, type U..L554
Process 69
Proportioning
Bulletin 300 360
Vertical or horizontal.....336
Refinery & process with mechanical seal 439
Rotary 481b
Rotary, bulletin LG.....454–455
Screw 481a
Screw
External gear & bearing bracket type R543a
Hopper type.....R543c
Internal gear & bearing type...R543d
Liner type R543b
Slurry, bulletin 181.....36
Steam, bulletin W 11-B13B.....502

Page

Vacuum
Compound 550a
Single stage 550b
Rectifiers, mechanical.....103–109, 395
Refractories, electric furnace, bulletin 458 .....35–38h
Refractories, furnace 32–33
Refrigerating machines, centrifugal...430
Refrigeration equipment 497
Safety heads.....365
Scales
Belt conveyor.....68
Dust-tight
Belt-feeding & weighing, bulletin 1549 .....468d
Electric, bulletin 3649.....468a
Heavy-duty, bulletin 3946.....468b
Solenoid or motor-operated discharge, bulletin 1449.....468c
Electronic weight control, bulletin 0351 .....463f
Self-checking, large tonnage, bulletin 2140-2.....468e
Tank & hopper weighing.....R552
Screens
Motor-vibrating 561d
Perforated T426
Seals, leakproof, rubber O-rings.....440
Separators
Air 561f
Continuous, bulletin C-19.....364
General line.....B412
Gravity 292a
Magnetic 78a
Sifters
Gyratory T338b
Gyratory, bulletin 06B7633 and 06B7625 366–367
Spectacles, with plastic or heat-treated glass lenses L532
Speed reducers.....545d
Steam traps 371
Steam traps, bulletin 152.....H302
Stoners, air-float.....292b
Strainers, monel wire screen.....T392
Sulphur 487
Superheaters, steam 353c
Switches, hopper level.....BR562a
Switchgear with transfer bus.....22
Talcs
Fibrous TR562c
High iron content.....TR562d

USE THIS HANDY POSTCARD . . .

Circle desired item, fill in reverse side, tear out and mail

READER SERVICE POST CARD

Advertisements

2	31	61	65a	86	120–121f	138–139m	251	293	319d	345e	374	403c	429	465	480	509a	TL535	R546d	BT562b
4	32–33	62–63a	65v	87	120–121g	138–139n	252	295	319e	346	375	404a	431	466	481a	509b	BL535	R546e	RT562c
5a	34	62–63b	66–67	88	120–121h	138–139o	253a	296–297	319f	347	377	404b	432a	467	481b	509c	R535	R546f	RT562d
5b	35–38a	62–63c	68	89	120–121i	140	253b	T298a	319g	348	378	405	432b	468a	482	510a	536	R546g	RB562a
5c	35–38b	62–63d	69	90–91	120–121j	141	253c	T298b	321	349	379	406	432c	468b	483	510b	L537a	R546h	RB562b
5d	35–38c	62–63e	70	92–93	120–121k	142a	254	B298	323a	350	380	407	432d	468c	484	510c	L537b	R546i	RB562c
5e	35–38d	62–63f	71	94–95	122–123a	142b	255	299	323b	351	381	408	433	468d	485	511	L537c	548	563
6	35–38e	62–63g	72	96–97	122–123b	142c	256	300a	323c	352	382	410	434	468e	486	512	L537d	550a	564a
7	35–38f	62–63h	73	98–99	124–125	142d	257	300b	323d	353a	383	411	435	468f	487	513	TR537	550b	564b
8a	35–38g	62–63i	74a	100–101	126–127	142e	262	301	323e	353b	384	T412	436	469	488	514	BR537	L551	564c
8b	35–38h	62–63j	74b	102–103	128–129	142f	263	T302	323f	353c	385	B412	437	470	489	515	538	R551	564d
8c	35–38i	62–63k	74c	104	130–131a	142g	264	B302	323g	353d	387	T413	438	471	490	516	539	TL552	564e
8d	39a	62–63l	75	107	130–131b	144	267	303	328	354	T388	B413	439	472	491	517	L540	BL552	L565
9	39b	64	76a	108–109	130–131c	225	269	305	328	355	B388	T414	440	473a	492a	518	R540	R552	TR565
10	40	65a	76b	111a	130–131d	229	271	306a	329	356	389	B414	442	473b	492b	519	541a	553	566
11	41	65b	76c	111b	130–131e	231	274	306b	330–331	357a	390	415	443	473c	493–494	520	541b	L554	L567
12a	42–43a	65c	76d	111c	130–131f	233a	276	307a	333a	357b	391	T416	444–445	473d	495a	522	541c	R554	R567
12b	42–43b	65d	77	113	130–131g	233b	277	307b	333b	357c	T392	B416	446	473e	495b	524	541d	L555	568
12c	44	65e	78a	114	132	233c	279	308	T334	358	B392	T417	447a	473f	495c	525	542	R555	569
13	45	65f	78b	115	133	233d	280	309	B334	360	393	B417	447b	473g	495d	526	L543	556	L570
14	46–47	65g	79	116–117a	134–135	233e	281	310	335	361	T394	T418	448–449	474	496	527	R543a	557	TR570
15	48	65h	80–81a	116–117b	136–137	233f	282	311	336	362	B394	B418	450	475a	497	528	R543b	558	TR571
16	49	65i	80–81b	116–117c	138–139a	234–235	283	312–313	T337	363a	395	419	451	475b	498	LT529	R543c	559	BR571a
17	50–51	65j	80–81c	116–117d	138–139b	236	285	315	B337	363b	T396	420	454–455	475c	499	LB529	R543d	560	BR571b
18–19	52a	65k	80–81d	116–117e	138–139c	237a	287	316	T338a	363c	B396	421	456	476	500	R529	544	561a	TR592
20	52b	65l	80–81e	116–117f	138–139d	237b	288	317a	T338b	363d	397	422	457	477	501	LT530	545a	561b	BR592
21	52c	65m	80–81f	116–117g	138–139e	237c	289a	317b	B338	364	T398	423	458	478	502	LB530	545b	561c	601a
22	52d	65n	80–81g	116–117h	138–139f	239	289b	317c	339	365	B398	424	459	479a	503	R530	545c	561d	601b
23	53	65o	80–81h	118–119	138–139g	240	289c	317d	340–341a	366–367	399	T426	460	479b	504	531	545d	561e	601c
24–25	54–55	54p	80–81i	120–121a	138–139h	241	289d	317e	340–341b	369	400	B426	461	479c	505	L532	L546	561f	601d
26	56	65q	82	120–121b	138–139i	243	290	317f	343	370	401	427a	462	479d	506	R532	R546a	LT562	601e
27	57	65r	83	120–121c	138–139j	244	291	319a	344	371	402	427b	463	479e	507	533	R546b	LB562	601f
28–29	58–59	65s	84	120–121d	138–139k	245	292a	319b	345a	372	403a	427c	464	479f	508	534	R546c	RT562a	602
30	60	65t	85	120–121e	138–139l	247	292b	319c	345b	373	403b								

Editorial Items

101	111	121	131	141	151	161	171	181	210	220	309	318	327	336	345	354	363	372	381
102	112	122	132	142	152	162	172	201	211	301	310	319	328	337	346	355	364	373	382
103	113	123	133	143	153	163	173	202	212	302	311	320	329	338	347	356	365	374	383
104	114	124	134	144	154	164	174	203	213	303	312	321	330	339	348	357	366	375	384
105	115	125	135	145	155	165	175	204	214	304	313	322	331	340	349	358	367	376	385
106	116	126	136	146	156	166	176	205	215	305	314	323	332	341	350	359	368	377	386
107	117	127	137	147	157	167	177	206	216	306	315	324	333	342	351	360	369	378	387
108	118	128	138	148	158	168	178	207	217	307	316	325	334	343	352	361	370	379	388
109	119	129	139	149	159	169	179	208	218	308	317	326	335	344	353	362	371	380	389
110	120	130	140	150	160	170	180	209	219										

Card Expires October 15

Page

Soft particle TR562b
True TR562a
Tank cars 229, 544
Tankage, process, petroleum & chemical 508
Tantalum 281
Tools, industrial 401
Towers
Cooling, catalog CT-42-4 82
Impervious graphite, karbate 315
Tube cleaners 80–81a
Tube cleaners, cutter heads R535
Tubes, copper, water 482
Tubes, steel 513
Tubing
Alloy 346
Alloy, high temperature 18–19
Flexible metal, four-wall, interlocked 41
Heat transfer, customer engineering service 542
Seamless, flexible metal 307b
Stainless steel 463
Stainless steel, large diameter 523
Tunnels, cooling T298b
Turbines
Mechanical drive 80–81g
Mechanical-drive, bulletin GEA-4955A 448–449
Steam
Single and multi-stage 504
Solid-wheel, bulletin S-116 519
Type E, bulletin M-3896 299

Page

Vertical B392
Turbochargers for diesels 80–81f
Utiliscope, wired television, bulletin 1025C 378
Valve parts, stainless steel threading 65h
Valves
Angle 492b
Application data for proper valve selection 65f
Automatic 52a
Bronze 427b
Bronze
Iron steel or stainless steel 528
Screwed or flanged end 323c
Cast steel 333b
Cast steel with 18-8 shafts 52d
Check, tilting disc, catalog No. 30 465
Control 4
Control, catalog 1500B 387
Control, series 700 295
Control spherical, dust-tight B416
F. durco 317a
Fittings & accessories, stainless steel, catalog 52 ..... 65o
Float, No. 60 ..... TL552
Flow control BR562c
Gate
Cast steel 243, 256
Iron body, bronze mounted 564a
Revolving disc 85
Stainless steel 564d
stainless steel, comparison charts 65b

Page

Glass sight 564e
Globe, stainless steel 564c
Hastelloy B, resistant to acid chlorides 323g
High pressure reducing, bulletin 931 ..... 8b
Hub-end, cast iron 52b
Hypreseal
Gear operated 323e
With combined lubricant screw and giant button head-fitting 56
Iron 427a
Lift-plug, non-lubrication, for tetraethyl lead 305
Monel for food industries 323b
Ni-resist
For handling caustic liquors 323f
Gage, cast iron 231
Plug
Cam-sealed 510a
Cylindrical 79
Flush type 473c
Lever-sealed 510b
Lubricated 303
Self-sealed, lubricated 510c
Pressure reducing, bulletin 1000 ..... 8a
Pressure regulating
Brass 263
Bulletin 966 ..... 8d
Bulletin 972 ..... 8c
Screwed-end, bronze 52c
Solenoid T337
Solenoid, direct acting TL562
Stainless steel, flow diagrams 65c
Stainless steel, for oxidizing conditions 323a
Stainless steel, technical periodical 65p
Steel 427c
Swing check 564b
Three-way, multiport 323d
Y-globe 492a
Vaporizers, Dowtherm 374
Vibrators, electric BR562b
Vitamins 403b
Vessels
Reaction, stirring type 306b
Reaction, shaking type 306a
Water treatment
Demineralizers, ion-exchange, bulletin 200 ..... 300a
De-ionizers, two-bed 369
Ion Exchange Resins & Equipment 100-101
Well water systems 515
Wire mesh products BL552

ADVERTISING STAFF

SALES MANAGER ..... Bayard E. Sawyer

BUSINESS MANAGER ..... Albert E. Weis

Sales Representatives

ATLANTA ..... R. C. Maultsby
BOSTON ..... W. D. Boyd
CHICAGO ..... L. A. Cunningham
CHICAGO ..... J. M. Rodger, Jr.
CLEVELAND ..... D. G. Sawyer
DALLAS ..... J. H. Cash
LOS ANGELES ..... J. H. Allen
NEW YORK ..... R. G. Frederick
NEW YORK ..... J. E. Tuohig
PHILADELPHIA ..... E. M. Schellenger
PITTSBURGH ..... D. A. Facka
SAN FRANCISCO ..... Ralph Dorland

USE THIS HANDY POSTCARD

Name _____

Position _____

Company _____

Address _____

City & State _____

PLACE
3¢ STAMP
HERE

CHEMICAL ENGINEERING
READER SERVICE DEPARTMENT
330 W. 42nd STREET
NEW YORK 36, N. Y.

Squirrel cage motors, slip ring motors, synchronous motors, repulsion induction motors, capacitor motors, direct current motors . . . open, enclosed, splash-proof, fan-cooled, explosion-proof . . . horizontal or vertical . . . for all phases, voltages and frequencies . . . in single speed, multi-speed and variable speed types . . . with or without flanges or other special features . . . with 5 types of gear reduction up to 432 to 1 ratio . . . with electric brakes . . . with mechanical variable speed units . . . and for every type of mounting . . . Master has them all and so can be completely impartial in helping you select the one best motor drive for YOU . . .

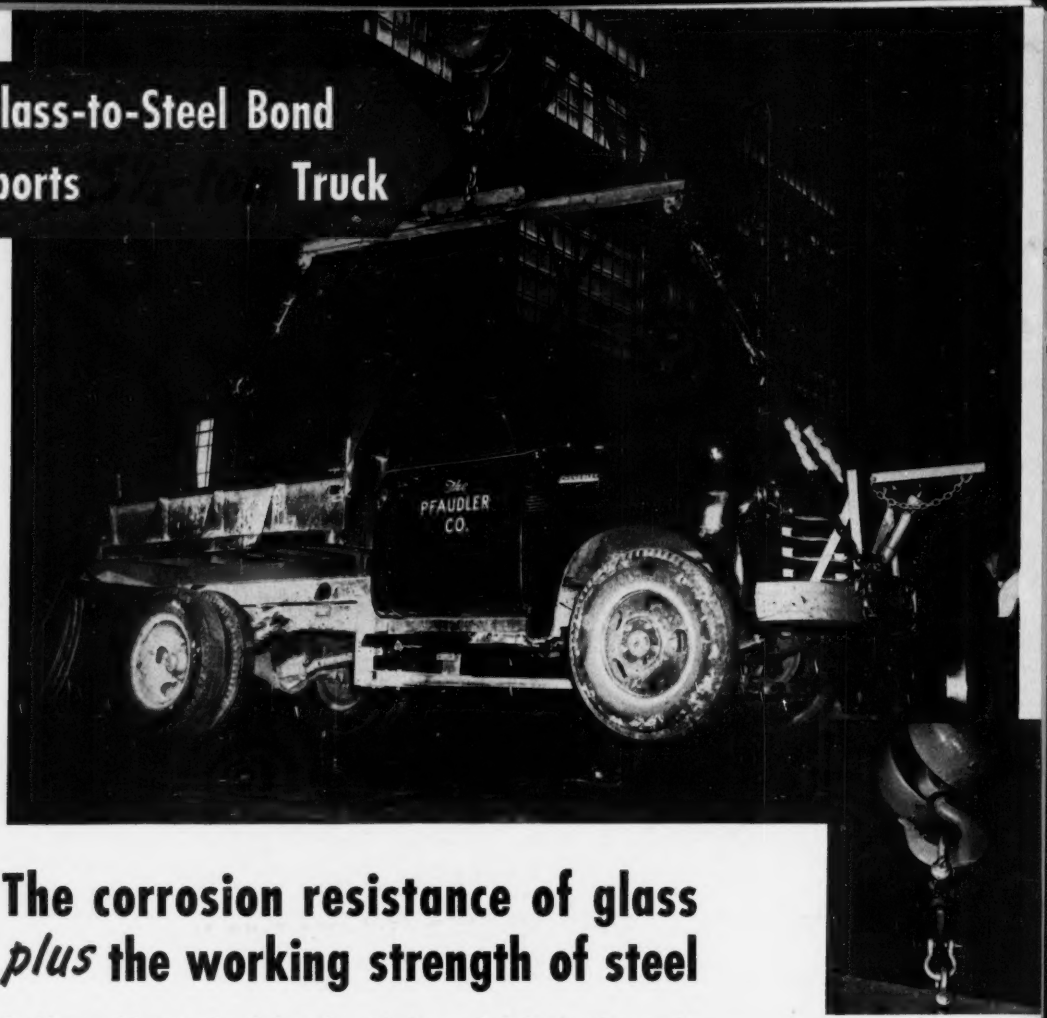
And all of these, the electric motors . . . the electric brakes . . . the gear reduction units . . . the variable speed drives . . . all are designed so they can be easily combined together to give you the RIGHT horsepower, the RIGHT shaft speed, the RIGHT mounting features in one compact power drive.

That's the horsesense way to use horsepower whether you want 1/8 horsepower or 200 horsepower.

THE MASTER ELECTRIC COMPANY
DAYTON 1, OHIO

1/8 TO 200
HORSEPOWER

Glass-to-Steel Bond Supports Truck



The corrosion resistance of glass *plus* the working strength of steel

For this unusual demonstration, the faces of two steel discs 4″ in diameter were glassed, then the discs were put face-to-face and fired at the same high temperature used in manufacturing Pfaudler glassed steel equipment. The bond between glass and steel, created by chemical action during this firing, locked the two pieces together so powerfully that the full weight (11,000 lbs.) of the truck failed to pull them apart. In a subsequent test, this bond withstood a pull of over 19,000 lbs., or 1,500 lbs./sq. in.

High temperature firing locks Pfaudler glass to steel and makes it hard and tough.

Because it can be so durably bonded to steel, glass, with its *almost universal corrosion resistance*, is widely used for both pilot plant operations and full-scale production. Pfaudler glassed steel reactors in capacities up to 3500 gallons are commonplace in chemical processing today. These units are equipped with agitation, can be jacketed, and are supplemented by a complete line of glassed steel accessories. Custom-built reactors as large as 8300 gallons, for severe chemical service, have been constructed. Glassed steel fractionating columns and evaporators have solved many serious corrosion problems.

Even at elevated temperatures and pressures, Pfaudler glassed steel is resistant to all acids except hydrofluoric. And now, with a new Pfaudler glass, it is possible to handle not only acids but also *alkaline* solutions up to pH 12 and up to 212°F. Thus it is possible to perform a wide variety of reactions in a single glassed steel vessel.

Whenever you have an equipment problem requiring *corrosion resistance, durability, and versatility*, as well as the *economy* which these features provide, look to Pfaudler glassed steel for the solution. Write for our new general catalog today.

CLOSE-UP showing how the glassed steel discs were connected to crane so as to support entire weight of 5½-ton truck. Below: close-up showing steel discs "glassed" together.

PFAUDLER THE PFAUDLER CO., ROCHESTER 3, N. Y.

Engineers and fabricators of corrosion resistant process equipment since 1884